PERSONAL COMPUTING

A Hayden Publication

September 1984 $2.50 USA

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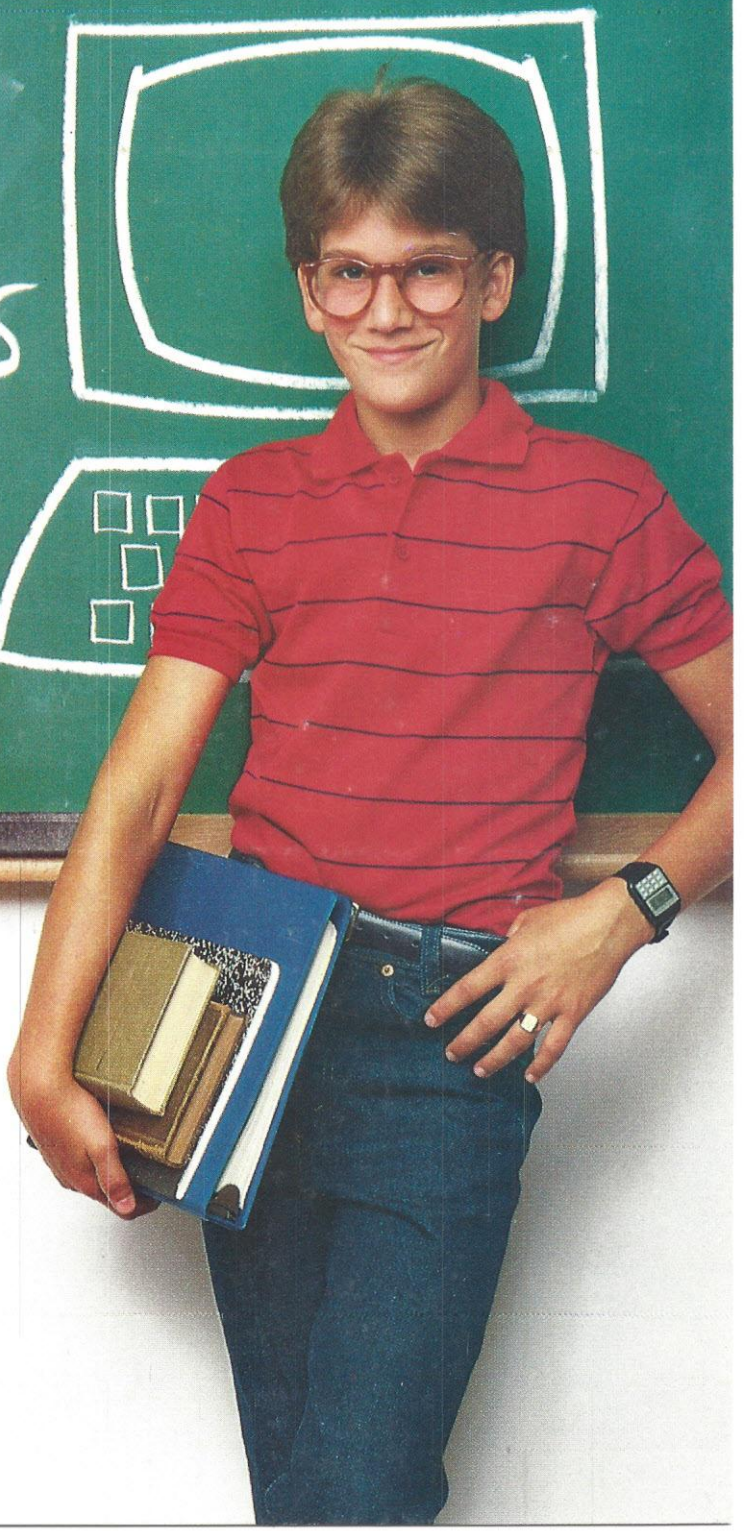

How To Enhance Your Presentations

The Best Sorts For Data Bases

When You Compute Outside The U.S.

Interview: IBM's Don Estridge

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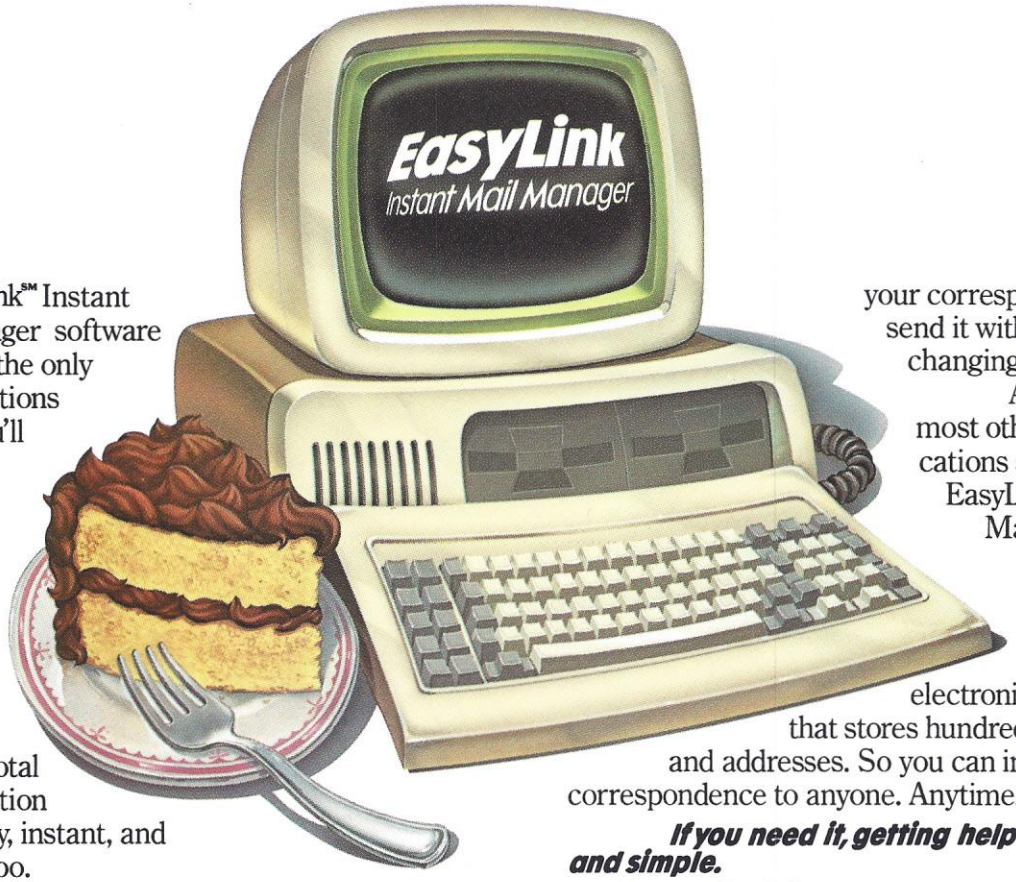

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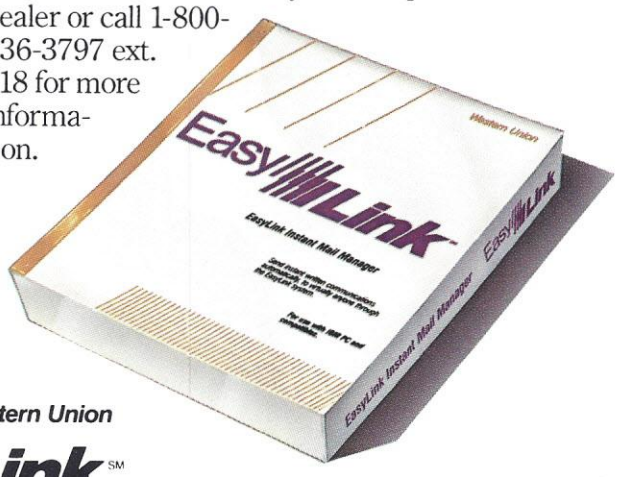

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CIRCLE 37

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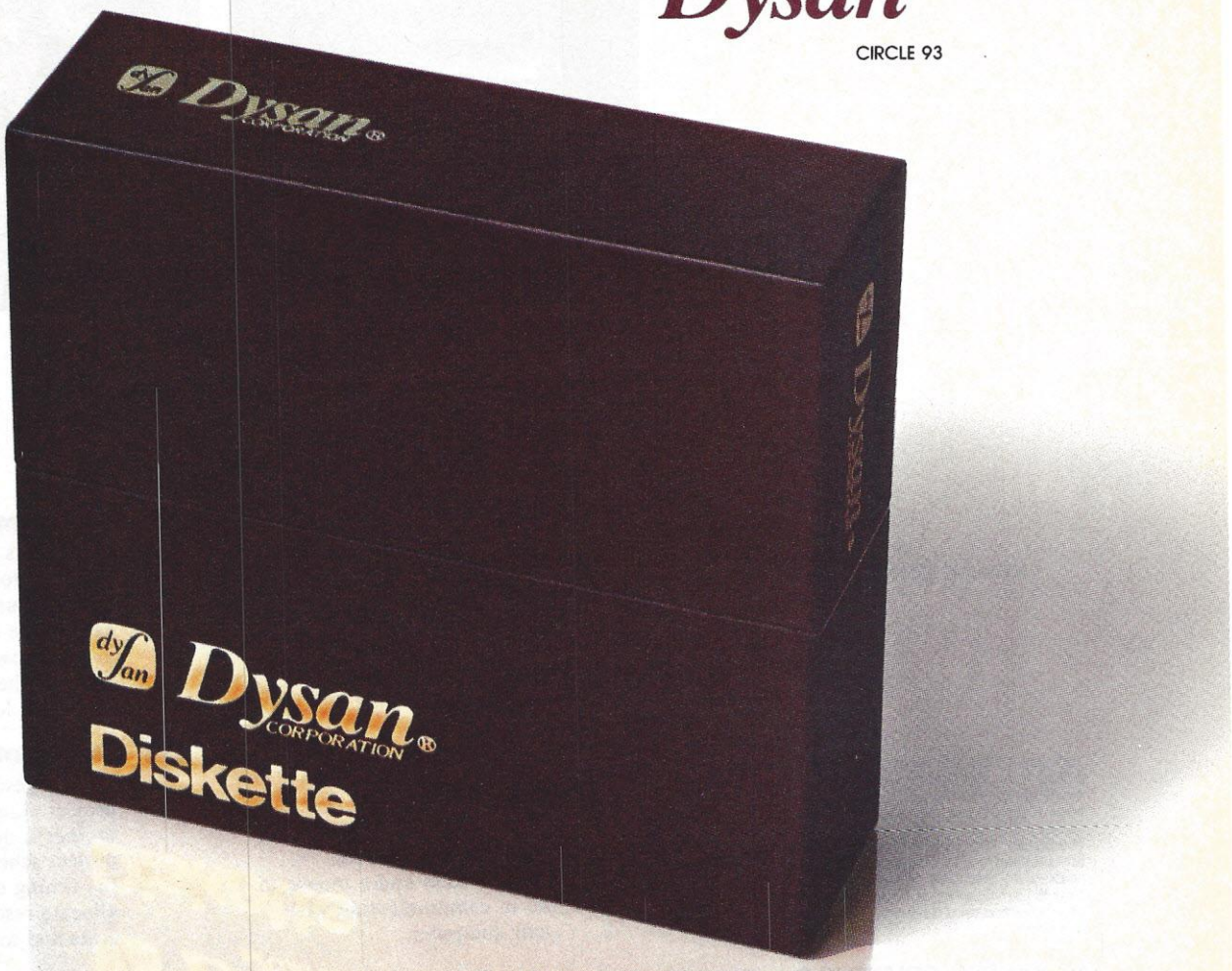

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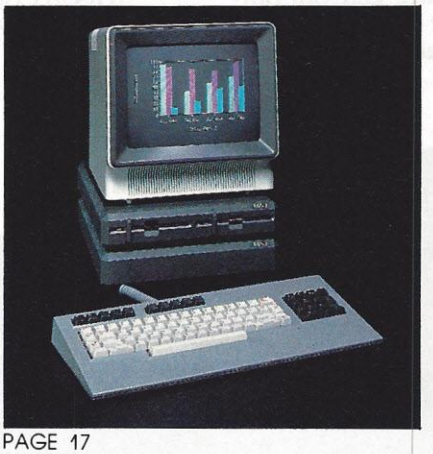

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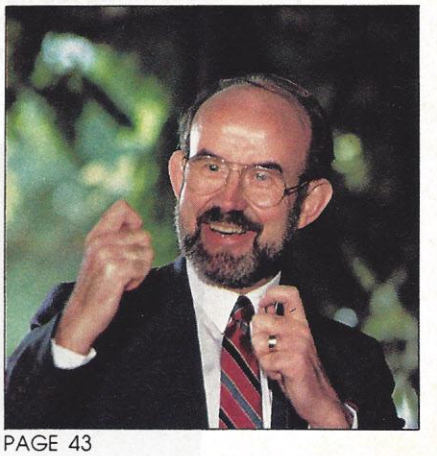

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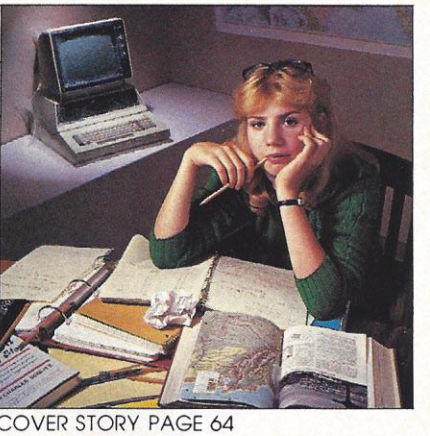

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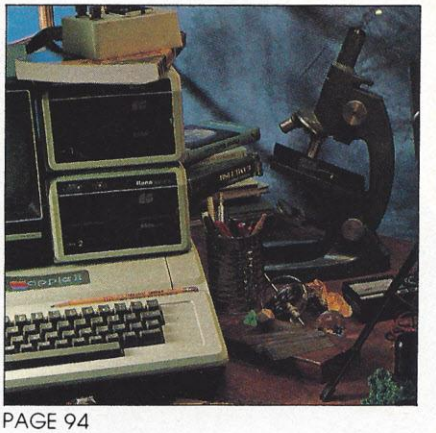

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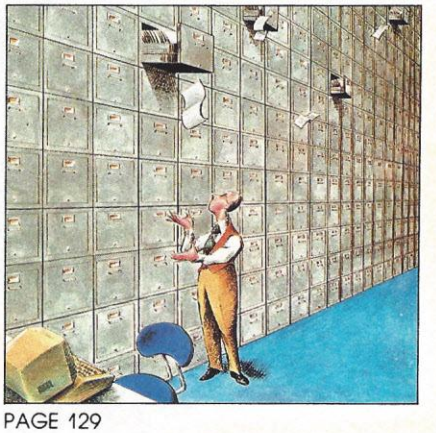

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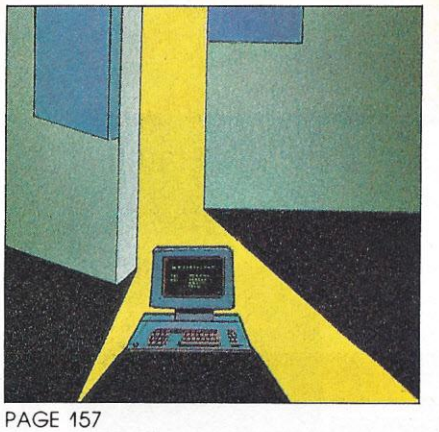

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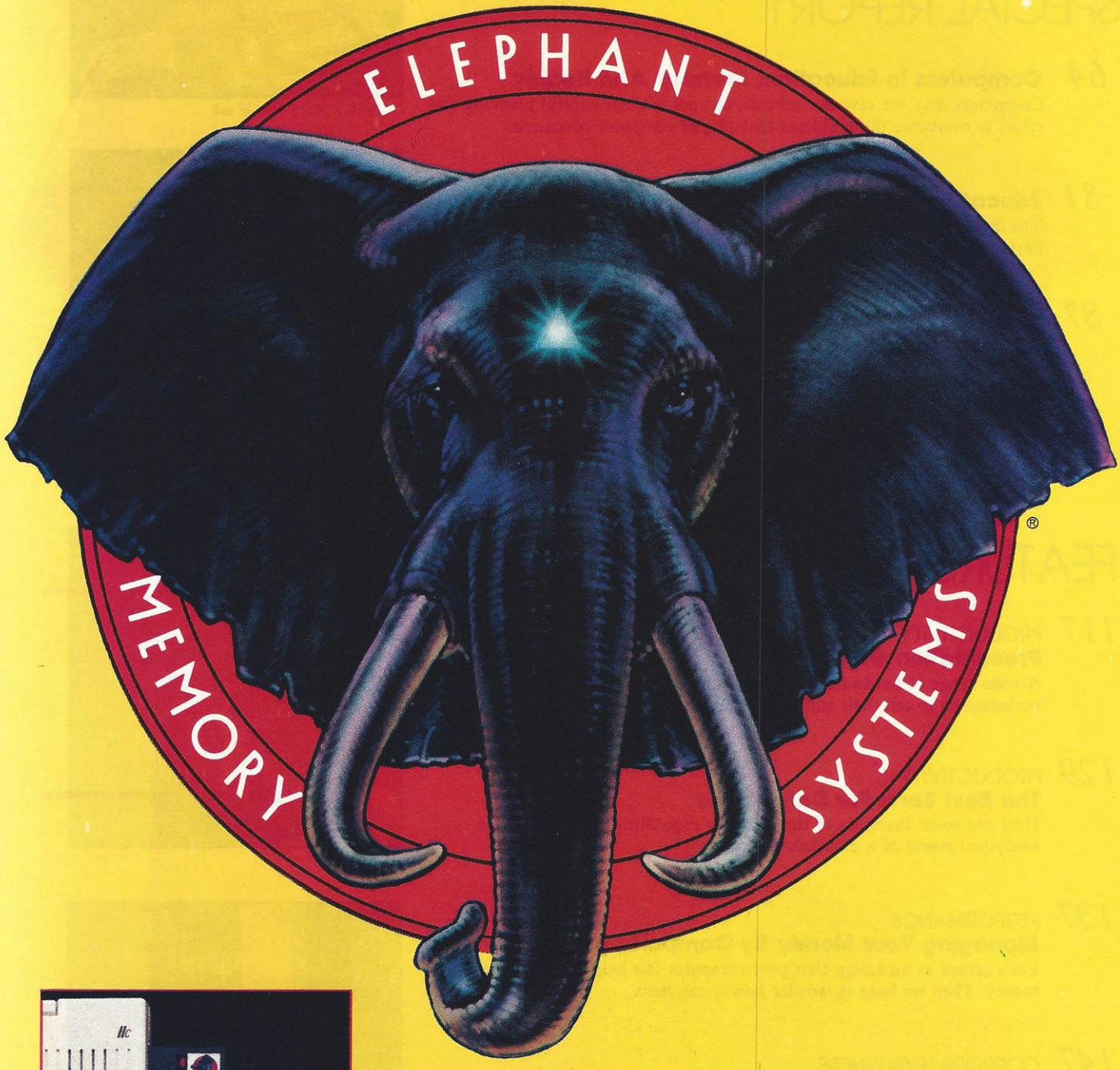

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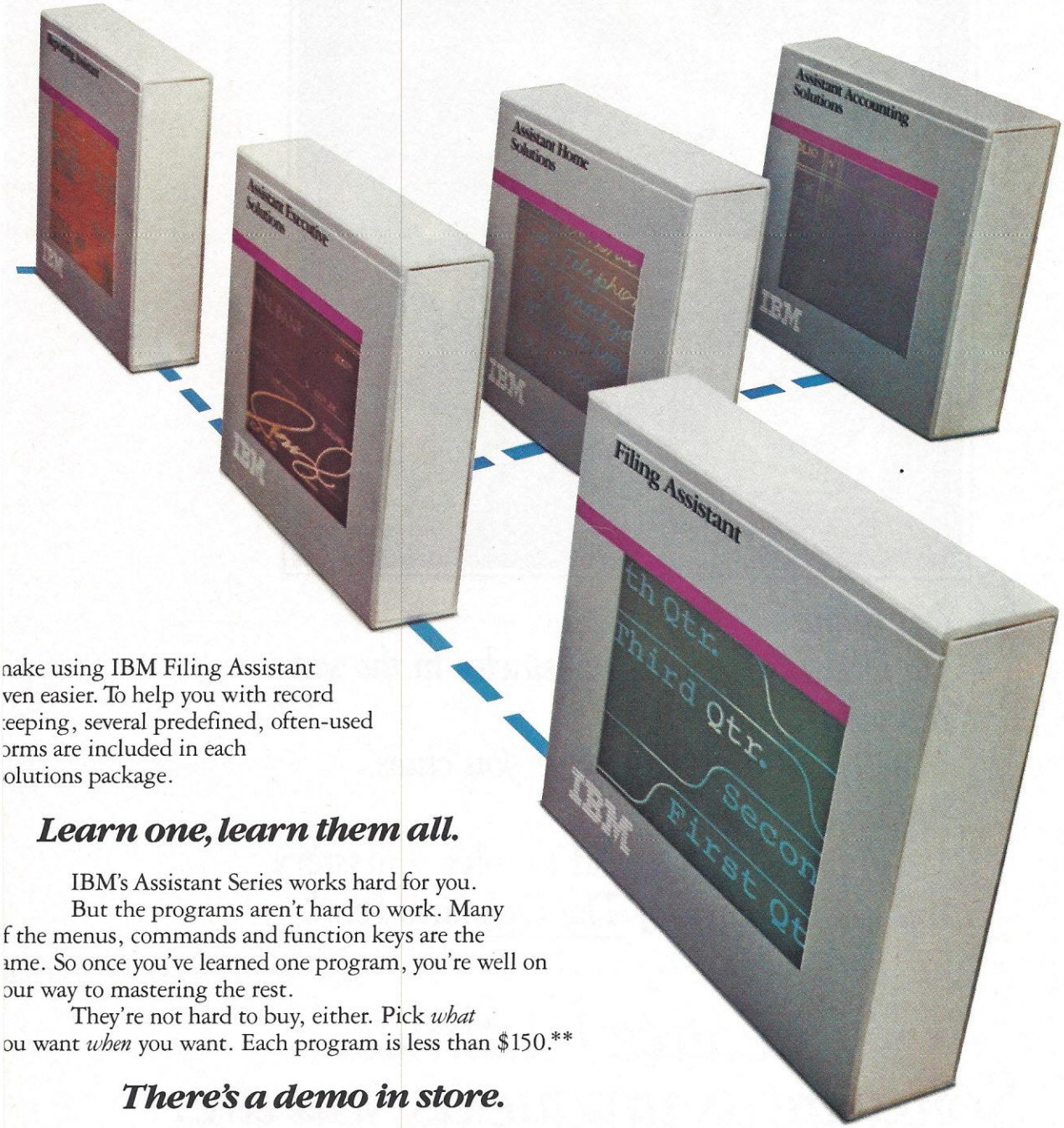

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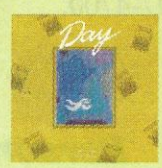

Day

Middle of the Road Lizard

CIRCLE 32

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*Software compatible with Apple must be ordered separately.

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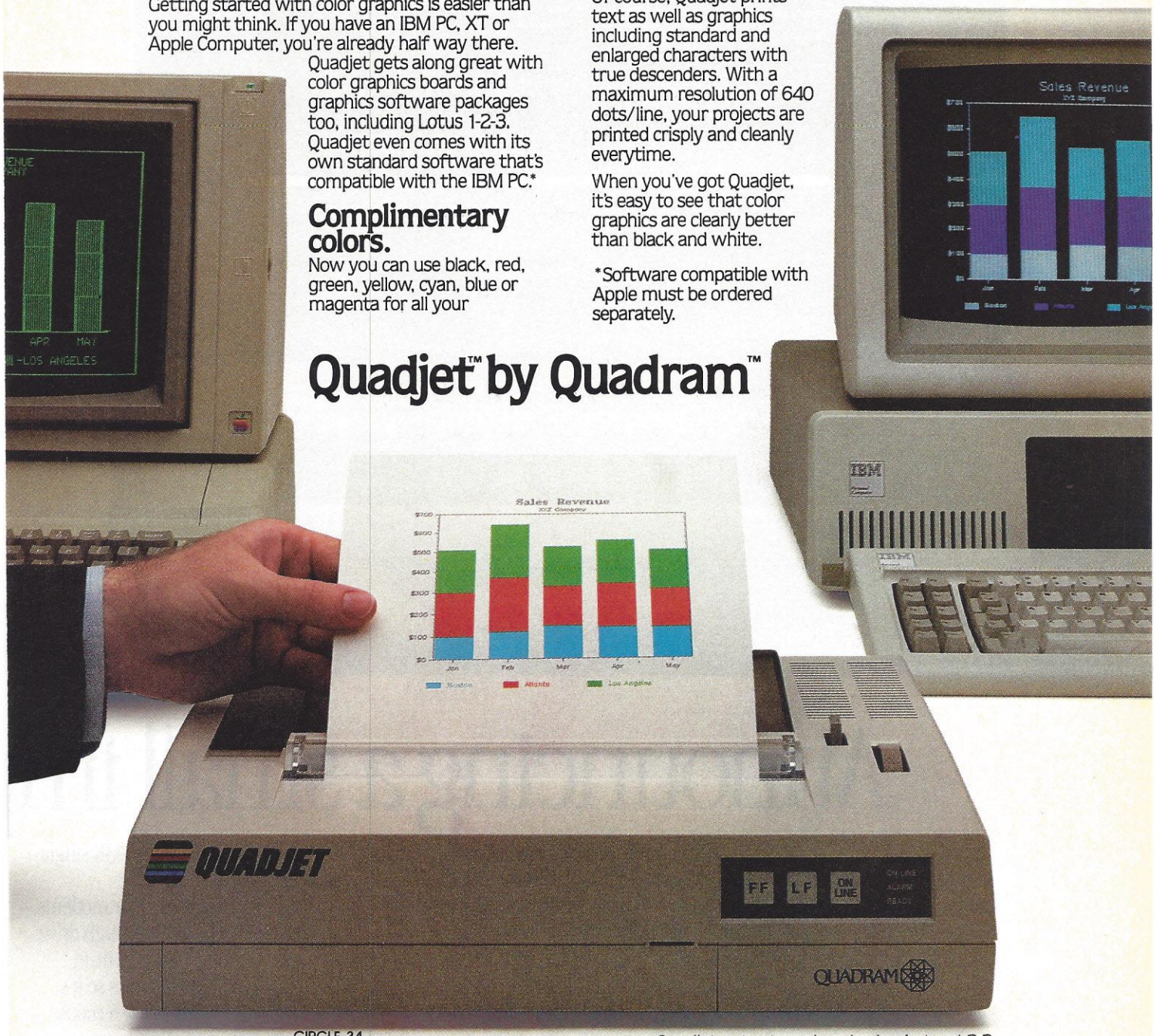

Quadjet output produced using Lotus 1-2-3.

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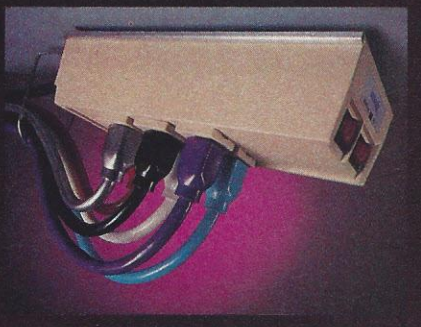

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CIRCLE 5

What?

What is the latest R&D activity in Japan in the field of industrial robots?

Is?

Is the name "datascan" trademarked?

Which?

Which drugs have been successfully used to treat osteoporosis?

What?

What is the current and projected market for frozen orange juice?

Are?

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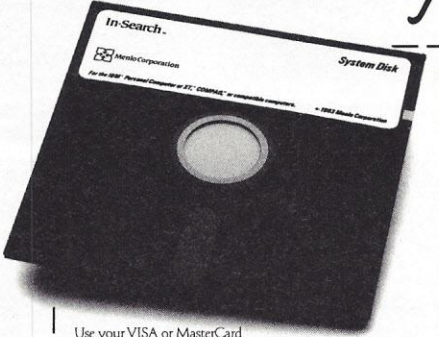

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THE ONE TO WATCH

CIRCLE 94

Ease Of Use Is Key To New Business Products

■ Mad·1 ■ Microsoft Project ■ PC Comm·plete! ■ Speed Key

POWER AND FUNCTION ARE KEYS TO NEW COMPUTER

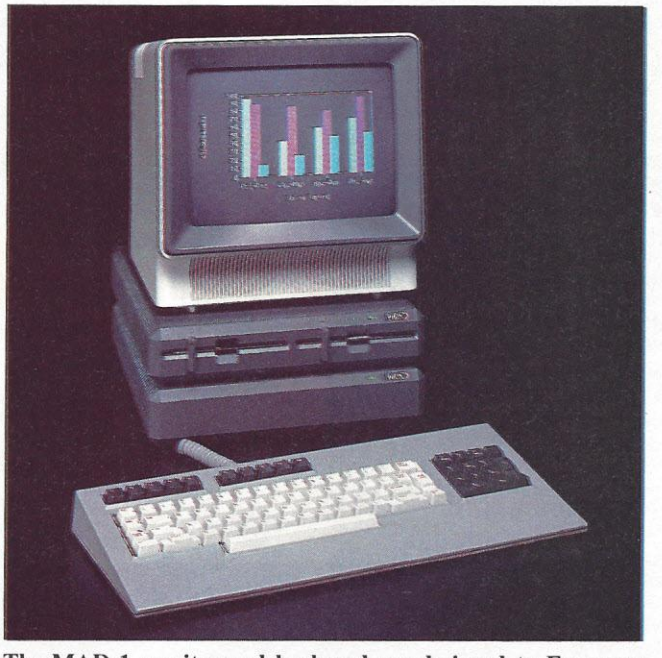
by Edward S. Foster, Associate Editor

Tradeoffs between compatibility and performance involve hard decisions for personal computer developers and users alike, and the choices seem to getting more complicated with the introduction of such machines as the MAD-1 (Modular Advanced Design) from MAD Computer, Incorporated. The MAD-1 is one of a number of new, so-called IBM Personal Computer compatibles, including the TRS-80 Model 2000 and the Mindset, based on the 80186 microprocessor from Intel Corporation. The 80186 is a more powerful processor than the 8088 chip employed by the IBM Personal Computer, which means that programs should run faster, but at the inevitable cost of some compatibility.

The people at MAD Computer say their system is intended for serious business applications and not for those who simply want an IBM clone for a little less money. This fact is reflected in the system's price—at the current list of $4195 for the basic 256k version with twin floppy disk drives, it's not going to win many price wars—and in the system's appearance. The MAD-1 doesn't quite look like any other personal computer.

The system's computing module and the module for the disk drives come in identical louvered boxes which can be stacked one on top of the other, placed side by side, or even, although it is not recommended, set on their sides. The monitor and keyboard are designed to European DIN ergonomic standards with such features as sculptured keys with palm rests and adjustable display tilt (although the monitor's touted swiveling feature seems to consist mostly of its annoying tendency to slide around on the top of the memory module). The designs of all four modules complement each other with a distinctly futuristic style.

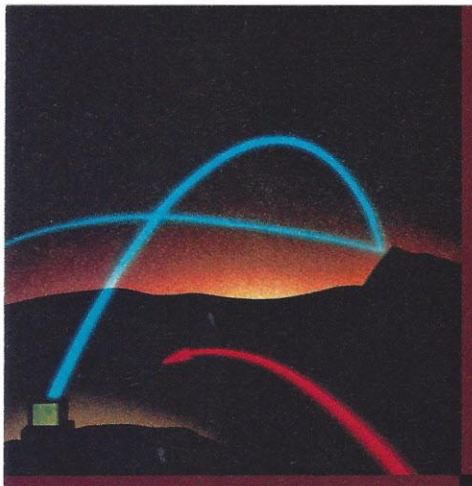
The minute you start with the system, you discover that its differences from the run-of-the-mill IBM-compatible are more than skin deep. The keyboard, for one



The MAD-1 monitor and keyboard are designed to European standards with sculptured keys and an adjustable display tilt.

thing, varies from the IBM standard in several ways, most of them all to the good. While still containing all the standard keys, the keyboard has been arranged in clusters by functionality in a way that makes accidental keystrokes less likely. The backslash key has been relocated from the spot where the left-hand shift key should be and the numeric keypad has been separated from the return key. Tactile feedback when typing could be a little firmer for our taste, but it is by no means inadequate. Naturally enough, anyone who has become totally dedicated to the IBM-style keyboard might find some of these differences disconcerting, at least at first, particularly the ten function keys being located in one row at the top of the keyboard.

The MAD-1 shines when it gets the chance to let its



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MAD-1 also includes built-in features for future options such as a phone plug socket and light pen connector.

80186 processor show its stuff. This it can do in impressive fashion on any number of applications programs which run under PC-DOS or MS-DOS. The MAD-1 can often accomplish time-consuming operations in such programs at more than twice the speed of the Personal Computer and most PC-compatibles. We tried a few everyday operations on the MAD-1 and found that the twice-as-fast performance held up fairly consistently. A WordStar search-and-replace operation on a long document which took almost 39 seconds on a Compaq portable took 21 seconds on the MAD-1. Recalculation on a large PerfectCalc spreadsheet took an average of eight seconds on a Columbia while requiring only four seconds on the MAD.

It should be noted that while some applications programs will run faster on the system, not all operations show a significant difference. Many operating system activities such as formatting disks and loading programs seemed to take place no faster with the MAD than with other MS-DOS machines. In fact, formatting a disk with MAD MS-DOS took several seconds longer than with MS-DOS 2.0 on several other systems. A number of as-yet unreleased programs which we tried on the MAD also sometimes showed quirks in the display or a failure to respond to a particular key on the keyboard. A number of other new or little-known programs, none of which we on MAD Computer's list of "MAD Tested Software," could not address the display at all, meaning the program addressed the screen in a way that the computer could not interpret.

The MAD Computer staff has thoroughly tested a number of popular Personal Computer programs to see if they work on the MAD-1, and the list of compatible packages includes Lotus 1-2-3, WordStar, the original MS-DOS version of Multiplan, PFS:File and Flight Simulator. The MAD engineers had to make some adjustments to their system to get a number of those programs to run, especially 1-2-3. Well-known programs which don't work on the MAD-1 at this time include VisiCalc and MultiMate.

MAD-1 is not likely to be a widely sold machine. For one thing, Intel's production of the 80186 chip has suffered a number of hitches which have made it available only in limited quantities to smaller customers like MAD Computer. Recognizing that they could not compete directly with the high-volume computer manufacturers, MAD concentrated much of its original sales effort through value-added channels as well as in the European market. The company only began selling the system through dealers in the U.S. last July.

One of the big attractions that the MAD-1 brings to this market is a careful and attentive design that allows for growth and future advances in technology. The system's modular design makes it relatively easy for MAD to offer its customers an upgrade path for adding new features to the system by replacing one of the modules. In fact, since the formal introduction of the computer, the company has come out with a number of options such as a 300-/1200-baud modem, a half-height 10Mbyte hard disk drive and local area network capabilities. MAD is also expending a great amount of its research effort in the area of artifical intelligence.

One problem with the MAD-1's expandability is that the compact computing module has room for only one add-on card, which will be taken up if you add a hard disk or more than 512k of memory. MAD offers an optional expansion module that allows the addition of four extra cards. It should be noted, however, that many of the features that generally require an extra board on other personal computers come standard on the MAD-1. The standard video controller in the computing module will support color as well as monochrome displays without the addition of an extra card.

While MAD Computer stresses the high-perforamnce nature of its system, that does not mean that it is hard to learn to use. The modular design makes it easy to set the system up, and you can do it without reference to the manual because you really can't do it wrong. But the manual's clear, concise style and generous use of illustrations and examples make it well worth the time it takes to go through it, especially for the inexperienced user. The manual even contains a fairly detailed explanation of IBM compatibility and the MAD-1.

Ultimately, the MAD-1 is pretty much as advertised. It is a powerful personal computer with an acceptable degree of IBM-Personal Computer compatibility for running popular applications programs and a classy modular design which should make it easy for MAD Computer to keep the system up to date. Whether its undeniable virtues are worth the price is a question which must be left up to the user to decide based on his own needs. If your primary concern is price and/or a high degree of compatibility with present and future software releases, you might do better elsewhere. For those, however, for whom speed and high-tech performance are important, the MAD-1 should receive a great deal of well-deserved attention.

FOR MORE INFORMATION: MAD COMPUTER, 3350 Scott Blvd., Bldg. 13, Santa Clara, CA 95051; (408) 980-0840.

FUNCTION KEYS FOR THE MOUSE

by Robert A. Sehr, Associate Editor

As personal computers continue to offer greater and greater performance benefits and the struggle for market share becomes more acute, the user interface is receiving increasing attention as a way of offering users an added value—ease in communicating with the machine.

First came menu-driven software to spare us from commands. Then came function keys to accomplish in a keystroke what had required a series of responses. More recently, the mouse and its pull-down menu claim to make using a personal computer as uncomplicated as dialing a telephone.

Koala Technologies Corp. looked at the varieties of interface available and felt that, somewhere in between functions keys and a mouse, a further benefit could be provided. Koala has created a device called Speed Key, an adoption of Koala's popular graphics tablet that provides 36 instant function keys for nine popular applications software packages in addition to mouse movement—through the fingertips—of the cursor. "We like to call it a four-wheel drive, all-terrain mouse," says company president Jeffrey Heimbuck, adding that, "I was surprised to find that somebody hadn't developed this already."

Unlike the typical mouse that requires a certain amount of clear desk space for movement, all the cursor movement is done within the confines of the 4″ by 5 ½″ touch-sensitive pad. But that is only the beginning. A push of one of the two buttons on top of the pad brings out a musical tone, signifying a change to "softkey mode."

Preprogrammed overlays

The 36 softkeys work in conjunction with overlay files for nine popular IBM Personal Computer applications packages: WordStar, PFS:Write, Lotus 1-2-3, Multiplan, SuperCalc, VisiCalc, BASIC, dBASE II and DOS itself. In addition to the supplied overlays, the user can create his own overlays if he is not satisfied with the keystrokes that are programmed or if he uses an application that is not covered. The keys can be used by booting Speed Key and then calling in one of the overlay files before entering the program.

Each of the 36 function keys can represent up to 80 keystrokes and as a result the user can save a lot of time and avoid confusion. In WordStar, for example, instead of typing "Control Q,F, Control N, Control N, Enter, left arrow, left arrow" to get to the bottom of a paragraph, you need only use function key #9 on the overlay and the sequence is automatically typed in. In Lotus 1-2-3, instead of typing "/, wic, enter," to insert a column, you simply punch function key #18.

In each of the overlay files, the button on the right side of the top of the KoalaPad is used for the function that

Speed Key comes with 25 blank overlay cards that can be inserted on top of the KoalaPad for customized speed keys.

Koala believes users require most frequently. In DOS, for example, the button represents the "Enter" key. In WordStar it represents Control X, or scrolling down a line. If, however, these do not represent your own patterns, you can simply change them. For those of us whose computer literacy is still in its infancy, Koala has, fortunately, remembered its own roots as a supplier of hardware and software for children. Changing the speed keys is, in short, child's play.

Although Koala has gone to considerable expense in printing up an 88-page manual, it really is not necessary. Many of those pages are dedicated to describing the commands programmed in the nine packaged overlay files. Only a couple of pages describe the process of customizing your softkeys—and even this is not necessary.

Custom overlays

Setting up a custom overlay file within the speed key program is accomplished from a simple menu brought up by typing "kc" from the A>prompt without a designated overlay. A menu choice called "edit current overlay" brings up a screen that prompts the user to select a key to be programmed. Any keystrokes currently assigned to that key will be displayed and these keys can then be edited using the finger on the KoalaPad to move the cursor in mouse-like fashion. The user then types in the keystrokes—for the last time—and that key will then represent these new keystrokes. A push of the right button ends the edit session. The process can be repeated for all 36 keys

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and the results can then be saved on a new overlay file.

The only keystroke users are advised against programming into the softkey is the "Control Break" key, which will cause the computer to exit the current applications program. If for some reason you do not want Speed Key active—if you want to use your KoalaPad for another application, for example—you also have the option of turning it off or, as Koala puts it—"hibernating."

Speed Key comes with 25 blank overlay cards that can be inserted on top of the KoalaPad for customized speed keys, if you do not wish to use one of the nine preprinted overlay cards. The documentation also advises users on setting priorities in the order of keys for custom-designed overlays. Koala has even designed a new pad for Speed Key to make it more appropriate for the business market.

The original KoalaPad was designed with kids in mind and therefore had to be more durable, Koala officials say. The newest version of the KoalaPad is streamlined and has a more businesslike look to it. It is not designed to be tossed around the room as the original pad was.

Value questioned

A question remains as to the value of Speed Key to experienced typists who are more accustomed to a keyboard than to function keys or a mouse. While it may appear to be more "user friendly" to touch a softkey than to make a series of keystrokes, there is a school of thought that anytime your fingers leave the keyboard while touch typing you are slowed down.

However, Koala's Heimbuck notes that the world—and personal computer users in particular—is no longer dominated by touch typists. There is a whole new generation of computer users—some of whom are now growing up using Koala's new Muppet Learning Keys on a Commodore—who may never be touch typists. This is the same generation that has grown up never knowing a world before pocket calculators and spelling correctors. For them, function keys will be as much a labor saving device as electric can openers and electric toothbrushes have been for our generation.

For those who love function keys and a mouse, Speed Key is an excellent marriage of the two. Experienced users who have gotten used to typing in their commands from the keyboard may, however, find Speed Key distracting—not to mention a waste of money.

Speed Key with the new KoalaPad for the IBM Personal Computer and its compatibles will sell for $199 for the package. Those who already have a KoalaPad can purchase the enabling software and overlay cards for $99. The KoalaPad attaches to a standard game port, which may have to be added to your system at additional cost.

FOR MORE INFORMATION: KOALA TECHNOLOGIES CORP., 3100 Patrick Henry Dr., Santa Clara, CA 95052; (408) 986-8866.

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EASY TO USE BUT NOT QUITE COM-PLETE

by Lisa B. Stahr, Associate Editor

Anyone who has spent the last few years anywhere near personal computers will recall that until very recently, all you had to do to use a communications package was tell the program the baud rate, parity setting, and character length. The software was so simple in its design and operation that little else was called for. On the other hand, little was given in return.

That brief period in telecommunications history was probably the only time when communications packages were easy to use. Today these programs, like so many other personal computing software packages, come with a multitude of options. From automatic answer to automatic log-on to automatic data transfer, the range of features grows with the announcement of each new product. And, as the feature list grows, so too grows the degree of difficulty in learning to use the package. Crosstalk XVI, one of the most popular "full-featured" communications programs around, requires several days to master.

In a world where Crosstalks run rampant, it's refreshing to find a package that makes it easy for you to get your personal computer communicating with one of its brethren. Transend Corporation's PC Com-plete!, a combination communications and electronic mail package for the IBM Personal Computer and its compatibles, is one of those rare finds.

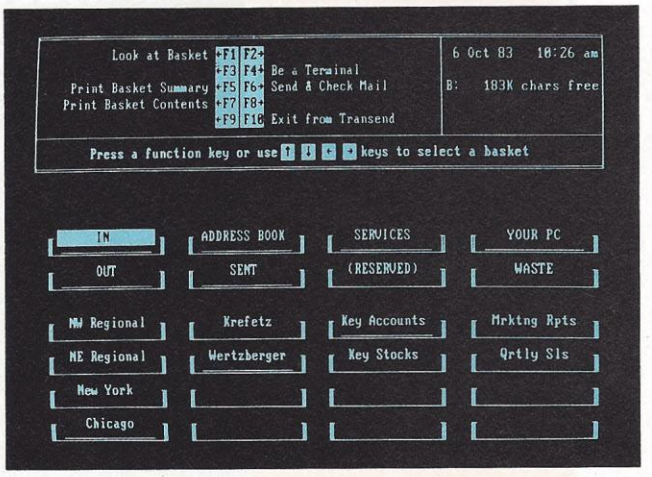
PC Com-plete! was designed to make telecommunicating as painless as possible, even for someone who has never before laid fingertips on a computer keyboard. With the help of a slew of icons, menus and windows, the program carefully guides you through the telecommunication process, all the way from log-on to sign-off.

Getting started

The primary functions of the program are represented with eight icons on the main menu. Putting PC Com-plete! to work is as simple as selecting one of these icons (all are baskets, such as an In basket, an Out basket, and a Waste basket) and following the instructions listed at the top of every menu page.

Three of the most important baskets represented are "Your PC," "Address Book," and "Services." The first of these, "Your PC," is where all of the information about your computer and your electronic mail address is stored, including your name, modem type, and your computer's configuration. Without this data both the communications and electronic mail functions of the program would be useless.

The next basket, "Address Book," is where the information for each person or computer with whom you communicate is stored. Again, the information includes the person's name, electronic address, and computer configuration, as well as his user identification number (if you're using a special electronic mail service). While this address book concept is a practical method for storing calling information, it does have a drawback: You must make an entry in the "Address Book" for every number you want to call, even if it's the only time in your entire life that you'll call that number. A manual dial command that enables you to call a number without entering it in the "Address Book" is an feature that PC Com-plete! should have.



The primary functions of PC Com-plete! are represented with eight icons on the main menu. Simply select an icon to go to work.

Where "Address Book" is geared primarily for the sending of electronic mail, "Services" is dedicated to performing more general communications tasks. It is here that the information PC Com-plete! will need to automatically log you onto other computer systems, such as The Source, CompuServe, or MCI Mail, is stored. If you belong to CompuServe, for example, you'd store the telephone number, your user identification number, and your password within "Services" so that PC Com-plete! can automatically log you onto CompuServe.

Also contained within the "Services" section are keyboard macros, or user-programmed commands. Each phone number within "Services" has room for 20 of these special instructions. Ten macros come with the program, such as Print On/Off and Hang Up; they can be changed, however, if you don't need them. Other macros are strictly user-defined. Any special command sequences that you use frequently, for instance, can be stored as keyboard macros and issued with a single keystroke.

To make creating and storing these macros even easier, PC Com-plete! designers included a special Automatic Learn Mode within the program that, when initiated, remembers all questions and prompts the remote computer sends to you and all the answers and command sequences you send back. When you call up the same service another time, the computer recognizes its questions and prompts

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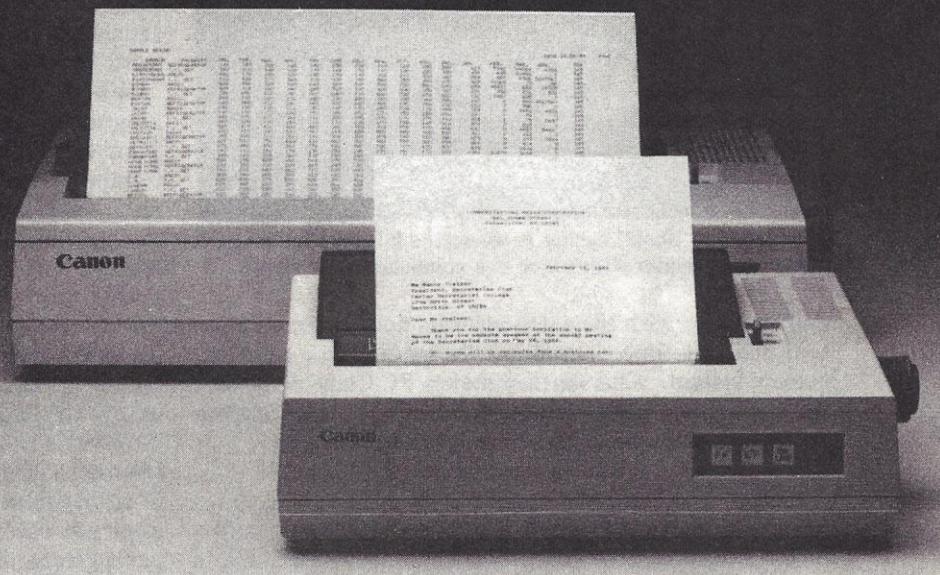

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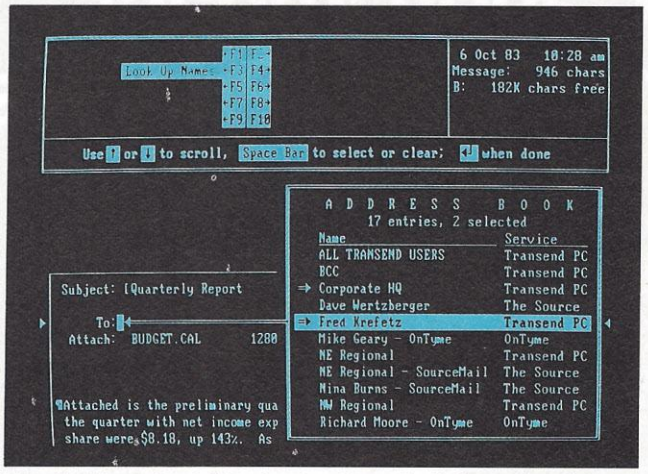

The "Address Book" basket is where the information for each person or computer with whom you communicate is stored.

and responds with the same answers and commands you sent the last time, automatically logging you onto the remote system. This feature makes PC Com-plete! easy for a computer novice to use, especially if a more experienced user defines the needed macros for him first.

Electronic mail

Facilitating the sending and receiving of electronic mail is one of the two major functions of PC Com-plete!, and in this respect, it performs well. It's easier to create and send mail messages with this program than with others of its kind because PC Com-plete! has a simple word processor within it. Instead of having to create a message using an on-line word processor or having to use a separate word processing package and uploading the message to the intended recipient, you can create the message and send it all with PC Com-plete!. Any attachments you also want to send can go with the letter, regardless of the program used to create them. A Lotus 1-2-3 file can be sent as an attachment, just as a table created with WordStar may be sent as an attachment.

When PC Com-plete! delivers the mail to another computer also using PC Com-plete!, the program automatically checks for any mail addressed to you. If there is a message, it will retrieve it and place it in your In basket. If an attachment on a separate disk accompanies the message, your program will retrieve it as well.

If you want the program to send or retrieve a message at a particular time of the day or night, such as when the telephone rates are lower, PC Com-plete! can accommodate you. The only part you take in the data transfer is to tell the program ahead of time when to send the message. The task is then attended to without any human intervention, including yours.

As an electronic mail package, PC Com-plete! is great; as a communications package, it is good. Granted, it has almost all of the many standard features you should expect from a communications program, including character stripping and converting, pacing, a function key toggle between the command and conversation modes, and file viewing while still on-line. The program also has the ability to send data directly to a parallel or serial printer and to send text, text and data, and binary files. Unfortunately, it also has an operational quirk that might make it less than satisfactory for sophisticated users who are seeking the last word in a full-featured telecommunications program.

When you telecommunicate with PC Com-plete! the program saves all of the data that comes into and goes out from your computer directly to a disk in your Personal Computer's disk drive. That in and of itself is not an unforgivable sin. For people who have a hard disk drive it really doesn't matter that all the data is saved. In fact, even for those of us with two floppy disk drives who aren't always quick enough to open a capture buffer in time to catch a tidbit that's gone scrolling by, saving all the incoming and outgoing data directly to disk might be a nice option to have. If at any time you decide you don't want to save the data that has come in, you can erase all of the information that has been stored on the disk by merely issuing an erase command. The problem with this method of saving data is that you cannot erase any information after you have received something you want to save. The package can erase and then save. But it cannot save and then erase without erasing everything on the disk. A related drawback is the lack of a search option that would allow you to quickly retrieve that stored information. Unfortunately, you have to go through the entire file to retrieve any little piece of data you might want to keep.

The program authors also failed to include any options for when the floppy disk fills up. You have no choice but to stop the transmission, tell PC Com-plete! to hang up the phone, put in a new disk, re-establish the connection and start the transmission over again. The program at least has the courtesy to always tell you how much disk space you have used and when your disk has only 20k of space left. It indicates with a blinking, inverse video warning light that you are about to run out of space.

According to its developers, PC Com-plete! is designed for anyone who has a need to communicate by computer, whether a home user or an employee of a large corporation. Of those users, computer novices and people who send and receive a lot of electronic mail probably will be the happiest with PC Com-plete!. More advanced telecommunicators may find that some of the program's limitations make it a little less than complete.

PC Com-plete! runs on the IBM Personal Computer and compatibles and lists for $229.95.

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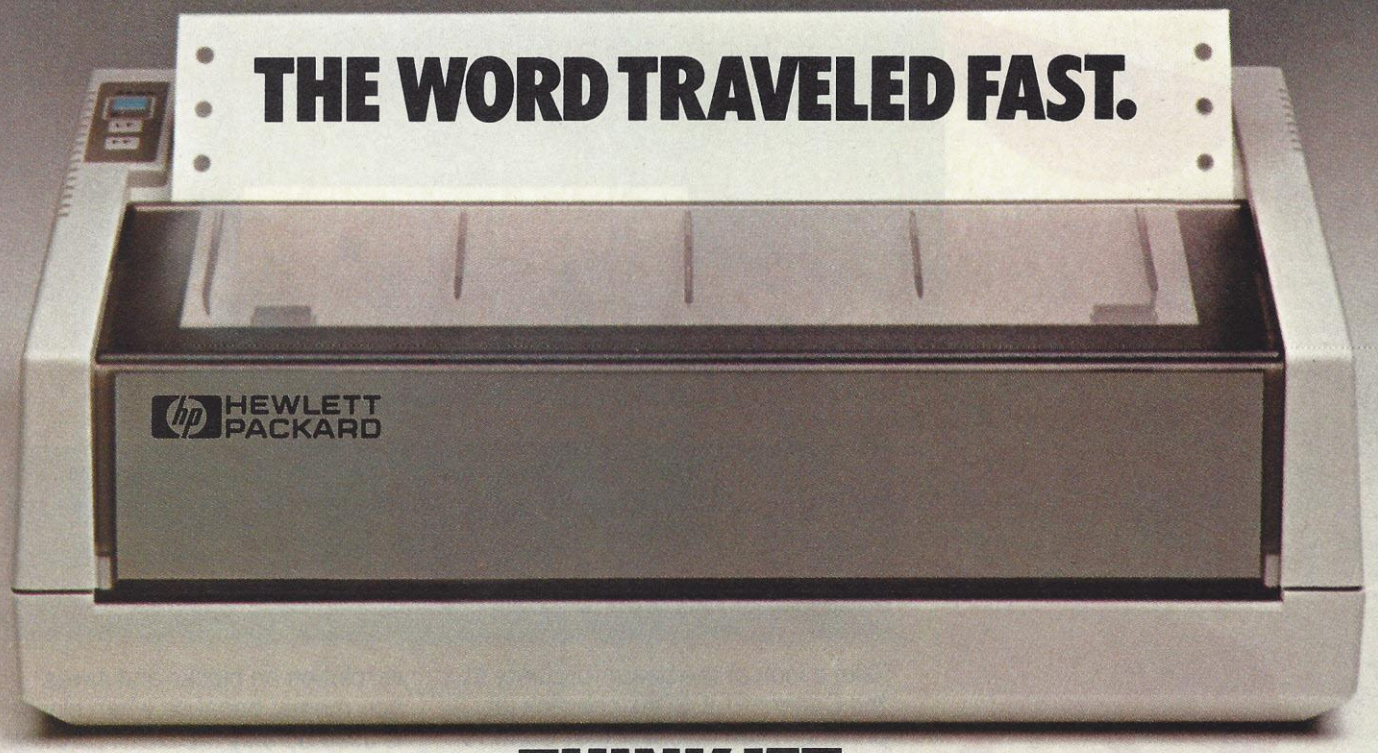

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KEEPING YOUR PROJECTS ON TIME AND UNDER BUDGET

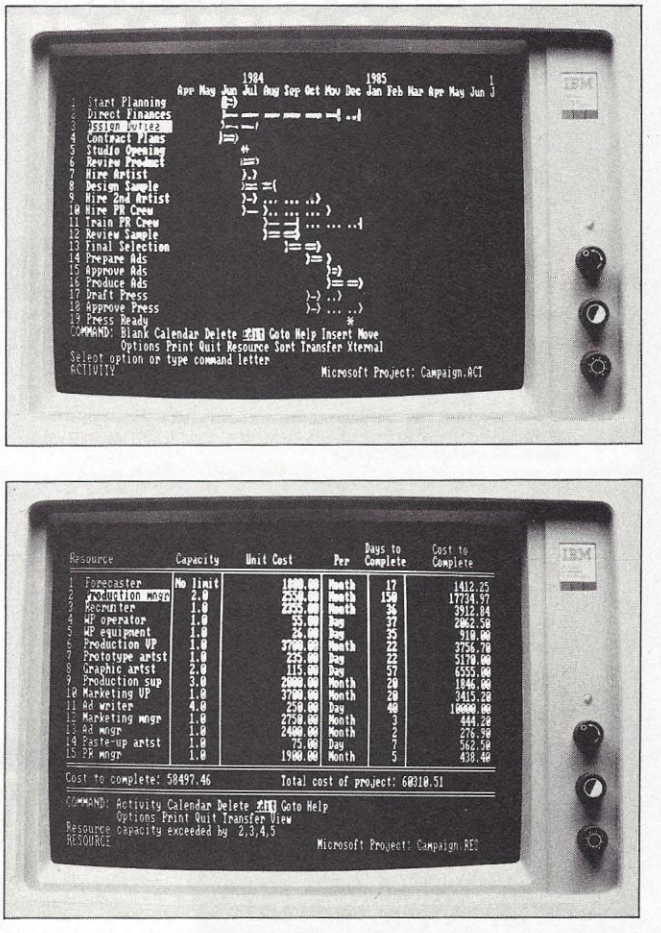
by Edward S. Foster, Associate Editor

Project management software, designed to help in scheduling complex tasks with maximum efficiency, was a relatively neglected area in the productivity category until recently. Major companies are now beginning to show more interest in developing scheduling software and Microsoft Project from Microsoft Corporation is a prime example.

The program is designed to help the project scheduler coordinate the timing of activities, allocate resources, determine costs and monitor progress. The basic concepts have been used by professional schedulers for years in the form of critical path analysis and PERT (Program Evaluation and Review Technique) charting. Microsoft wanted to find the best way to transport these techniques onto a personal computer to enable a much broader group of professionals to employ proven project management techniques in their own work.

In creating Project, Microsoft has focused on an approach which brings project scheduling and spreadsheet programs together. In fact, Project looks a great deal like Multiplan, Microsoft's own spreadsheet package, and is set up to allow the user to do many of the same what-if kinds of analysis for schedules that spreadsheets do for finance. Microsoft has also gone to considerable lengths to allow transfer of files between Project and other programs—not just Multiplan but Lotus 1-2-3 and other popular spreadsheets, data base managers and software packages.

To begin the actual scheduling process, the user must learn how to define his project as a set of activities requiring certain resources that must be furnished according to an interlocking schedule—tasks that are critically related through time.



The first thing one sees after booting Project is the activity screen (top), the central point of the program. The resources screen (bottom) can be used to calculate total costs.

The heart of the program

The first thing one sees after booting the program is the activity screen, the central point of the program. Along the top of the screen is a time scale, with dates stacked so they must be read vertically—which is a bit confusing until you get accustomed to it. The work area is divided into rows numbered from 1 to 19 down the left-hand side, with each row representing an individual activity within the project. You are not limited to projects of 19 or less activities, however, as the screen will scroll down as far as number 128, and even larger projects can be accommodated through file linking.

Once you have your list of activities fixed, Project does the rest of the hard stuff. As you enter activities and estimate how long they might take, the program constructs what is known in scheduling parlance as a Gantt chart, a graphic representation of how the activities relate to each other in the project's timeframe. When you tell the program which activities must necessarily precede others, Project defines a "critical path" chain of activities which must be completed on time in order for the entire project to meet its overall schedule. Similarly, slack time associated with non-critical activities is broken out to show how the user might reschedule it to reallocate resources.

Tracking the variables

Project's ability to track the resources, both personnel and equipment, needed for each activity as well as calculate associated costs are its essential features. While resources can be listed by activity through the main activities screen, a separate resources screen is automatically developed for an overall view of project costs. A third screen, the calendar, also supports the activities screen and is used to set up the overall timetable for the project, including holidays and vacations.

The resource screen can be used to automatically calculate total costs for the project as well as the cost to complete the project from the current date. The user simply supplies the program with the cost of each resource—be it $50 a day for a stock clerk or $5000 a month for an engineer—and Project keeps track of how much each resource is being used for different activities and the resulting cost. This allows the user to optimize schedules on a time-is-money basis.

The on-screen calendar makes it easy to define the timeframe for new projects and also allows for what-if manipulation—such as scheduling overtime. An aspect of Project which can be initially confusing is that all three types of screens—activity, calendar and resource—are saved automatically as separate but interrelated files. While using a common name for the overall project makes most of this transparent to the user, it does make for some insecurity when one is prompted to decide whether or not to write over the existing calendar file when you're just trying to save the activity file. (You should overwrite the file, by the way.)

While there is considerable value alone in being able to establish a practical project schedule—one that you know can be completed in a certain period of time at a fixed cost—Project may be even more appreciated when problems arise.

For example, let us hypothesize that a wise and magnanimous magazine editor is using Project to schedule his next issue. One of his writers reports an unexpected but quite unavoidable delay in the preliminary research for a major feature article. The editor could first check to make sure that the delayed activity is on his critical path, in case he built in a lot of slack time in the writer's deadlines. If no slack time exists, he can use Project to test alternative courses of action: Can a researcher be put on the story without adversely affecting the critical path elsewhere? If a freelancer is brought in to help, how much will that cost hurt the budget? Project will allow the editor to test these and other solutions quickly and make trade-off decisions between time and expense—perhaps even factoring in the cost of training a replacement for the writer in time to meet the following issue's deadlines.

Bringing all the elements together

Project provides methods to track more than one related project or projects that have more than 128 activities. The Xternal command, similar to the command used to link spreadsheet files in Multiplan, lets the user link data from one project to another, treating the supporting file as an individual activity in the dependent project. In our magazine example editor might request that each writer schedule his writing projects on a file which could then be linked with the editor's master file.

Project data can also be transported from files in the product management package to Multiplan or other programs supporting the Symbolic Link (SYLK) file format. This can be particularly useful when the project costs generated in Project need to be subjected to more detailed spreadsheet analysis.

Project can share files as well with a variety of programs supporting other standard file formats through CONVERTD, a useful file conversion program within the program. CONVERTD will translate files for use in columnar and delimited ASCII text files, DIF (Data Interchange Format) files, dBASE II (Symbolic Data Format) files and SYLK files. Microsoft also plans to include the CONVERTD program in other new products such as Chart and updated releases of established products.

Other useful Project commands include a sorting feature which reorders activity charts by activity length, by urgency on the critical path, by start dates, finish dates or alphabetically. Activities can be displayed and printed on a day-by-day timeframe or on weekly or monthly time scales to view more of the project at one time. Microsoft does not apparently expect there to be much need to measure activities by the hour, although the program will accept decimal fractions of days.

Project is, in general, easy to comprehend, and those things which seem strange at first glance probably reflect our lack of insight into the finer points of project scheduling. After all, the now familiar cells and formulas of spreadsheets seemed just as alien when those programs first made their presence known.

Microsoft Project runs on the IBM Personal Computer and IBM compatibles. The package retails for $250.

FOR MORE INFORMATION: MICROSOFT CORPORATION, 10700 Northup Way, Bellevue, WA 98004; (206) 828-8080.

PRICE ANNOUNCED ON AT&T PERSONAL COMPUTER

Prices on the new AT&T Personal Computer 6300, detailed in *Personal Computing's* July exclusive, have been announced by the company. The AT&T Personal Computer is available in two standard configurations: a dual floppy drive system with 128k retailing for $2745; or a hard disk with 256k priced at $4920. The disk operating system (DOS) for either system costs an additional $65. Both models are expandable to 640k of RAM.

AT&T also announced that it is direct marketing a number of popular software packages for its MS-DOS/PC-DOS-compatible personal computer, including Microsoft's Word and Multiplan, Ashton-Tate's dBase II and Friday!, MicroPro's WordStar, and Lotus' 1-2-3. Some of the software marketed directly by AT&T, such as dBase II, Microsoft Word and Multiplan, will also be available for the company's 3B line of supermicro and minicomputers.

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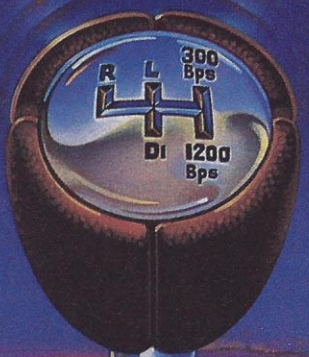

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CIRCLE 54

Computing's Expanding Horizons

■ What The Experts Think ■ The Art Of Technology ■ The Olympic Spirit

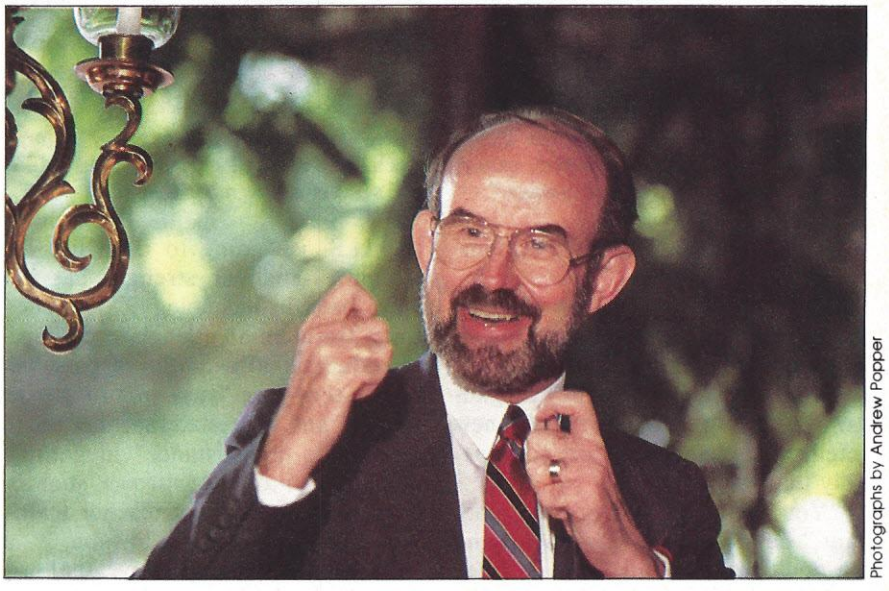
The Personal Computer Impact

The Human Side of Personal Computing" was the theme of a day-long discussion among leading authorities in a variety of computer-related fields at a recent forum sponsored by *Personal Computing* magazine.

The second annual *Personal Computing* Forum, held at The Tavern on the Green in New York City, explored the impact that personal computers are having on the people who use them. The forum brought together business, government, education and computer experts from around the country to offer their observations on issues surrounding personal computing, including topics such as the office worker's perspective on office automation, the differences in the way humans and computers "think," women and computers and the effective implementation of personal computers in schools.

Dr. Stuart Card, a member of the research staff at Xerox's Palo Alto (Calif.) Research Center and co-author of a recently published book entitled. *"The Psychology of Human-Computer Interaction,"* served as moderator for the forum.

Dr. Richard Byrne, professor at The Annenberg School of Communications at the University of Southern California and chairman of Spring-



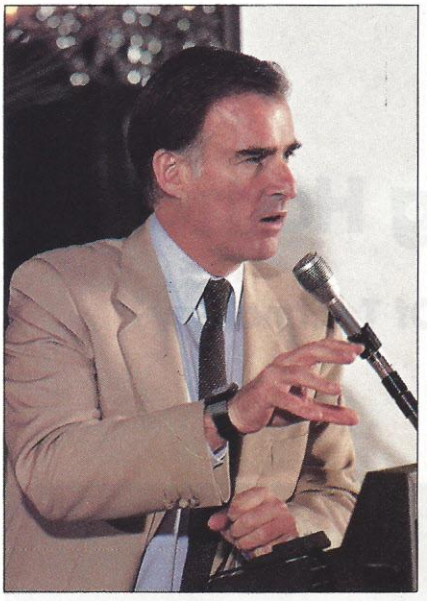
Photographs by Andrew Popper

Dr. Richard Byrne, the forum's luncheon speaker, likened a personal computer to an amplifier: "It makes you whatever you are but more so."

board!, a corporate training group, called the personal computer, "a miracle masquerading as a technology " and said it represents, "a quantum leap forward" in human history. But a personal computer, Byrne warned, can only serve to "leverage" skills a person already possesses.

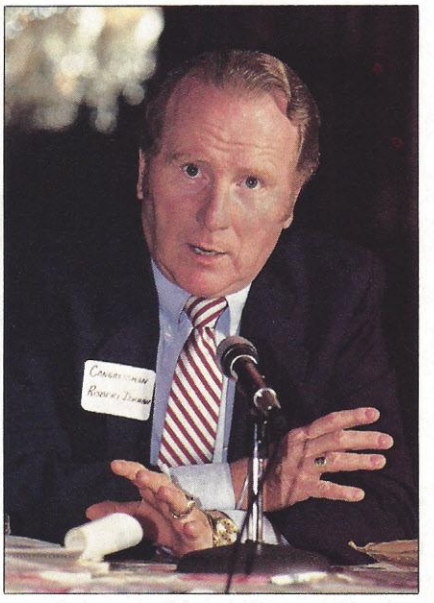
"A personal computer is like an amplifier in a stereo system," noted Byrne. "It makes you whatever you are but more so. Executives frequently come to me and they say, 'God, we are so disorganized, we've got to get Lotus (1-2-3 software).' I say, 'We should talk.' Because if you are disorganized on paper, you will become disorganized at computer speed (with a personal computer). So I work with people to figure out what it is they do well."

A bigger-is-better attitude toward personal computers is another misconception often held by executives, according to Byrne. "The technology is seductive," he said. "A lot of people are buying a computer and saying, 'As long as we're getting a little computer, let's get a big one.' They want to be sure it has expansion slots. To do



Gov. Jerry Brown pointed to the U.S.'s traditional strength in technology, calling computers our "underlying advantage."

Office Automation has a "dual nature, much like Dr. Jekyll and Mr. Hyde," said 9 to 5's director Karen Nussbaum.



Communication, with computers, is "the thing that makes us different from biblical figures," said Cong. Robert Dornan.

what? A lot of people want to customize all the technology."

Byrne also observed that children usually have an easier time picking up new computer skills because "kids are ignorant, and they know they're ignorant " allowing them to approach new intellectual challenges more comfortably than many adults.

"You have to be willing to be ignorant," he advised. "We grow up and we don't want to fail. This is a key problem with executives learning because they memorize the Lotus (1-2-3 program) prompt card before they log on . . . Kids don't do that."

Personal computers and their potential for education served as the focus for remarks by several forum panelists. Former Governor Jerry Brown of California, now chairman of the National Commission on Industrial Innovation (a non-profit group sponsored by about 25 major companies), told an audience of press and business people that the United States "has to respond" to the economic and educational challenges poised by rapidly growing nations such as Japan. And to meet these challenges, said Brown, the U.S. is "going to have use its strength—and our strength has always been in technology." The one-time presidential candidate claimed the educational potential of personal computers has "just begun to be tapped" and suggested that the "obvious points of resistance" in getting computers into the classroom, such as high costs and lack of teacher training, could be overcome in time.

"I believe it's imperative that we take the lead where we have the underlying advantage," said Brown.

Brown proposed the federal government create "centers of excellence" in at least five regions of the country where researchers and scientists could explore the potential of computers in the learning process. While acknowledging that the creation of such centers would require federal legislation, Brown asserted that the program would "bring the day closer when we fully utilize the potential of computers."

A second Brown proposal, one he said should have "more immediate results," called for a nationwide program of model schools, under which, he explained, schools would compete for federal and state grants by devising and then proposing a strategy for the use of computers in the classroom. Those who submitted the best proposals, as judged by a panel of school and public officials, would be awarded a computer for each child in the school, according to Brown. "The benefit of this," he noted, "would be to elicit concrete thinking about how to use computers in schools."

Dr. Mary Alice White, professor of psychology and director of the Electronic Learning Library at Columbia University, also projected an increasing computer presence in schools, predicting that the access to information provided by personal computers would be a "revolutionary" force in education. Dr. White said she foresees a move in education from a "print-bound channel of learning to multi-channel learning" with an increased emphasis on visual learning. This new direction in education will have several significant effects on school systems, said White, including helping to keep children with reading difficulties in the mainstream of the

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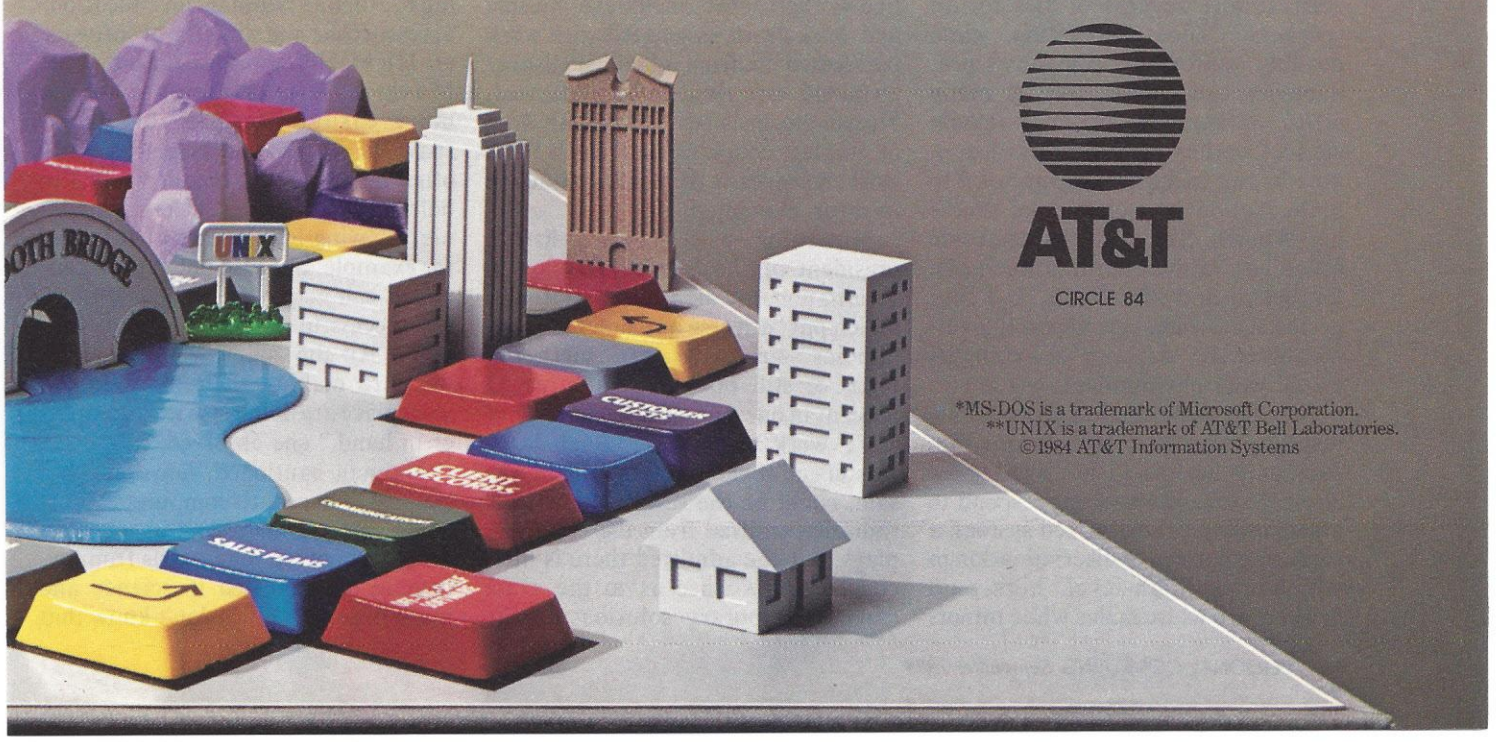

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CIRCLE 84

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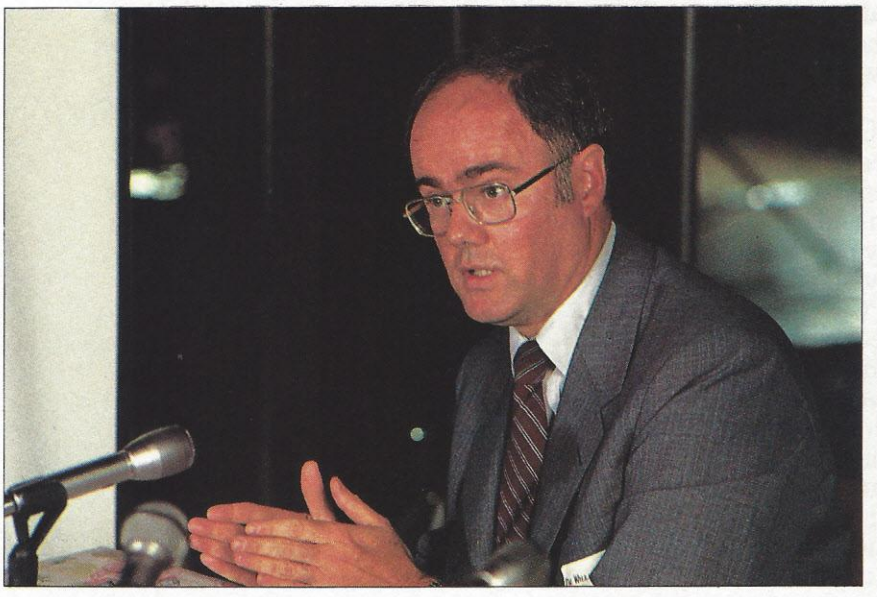


People, unlike personal computers, are unique—a quality which would be "a disaster" for computer makers, noted Dr. William Hobbs.

Dr. Mary Alice White sees "an emphasis on visual learning" from computers.

learning process; giving rise to a "highly individualized, informal learning environment" based primarily in the home; and spawning students who have discovered that learning can be fun to "demand that school be enjoyable."

Women and personal computers formed another major topic of concern among several of the forum speakers. Office automation, while possibly improving a company's productivity, can spell trouble for many office workers—particularly female clerical workers, according to Karen Nussbaum, executive director of 9 to 5, the National Association of Working Women. She said the electronic office has "a dual nature, much like Dr. Jekyll and Mr. Hyde" and suggested that women are especially vulnerable to the "dangers" of a computerized work environment.

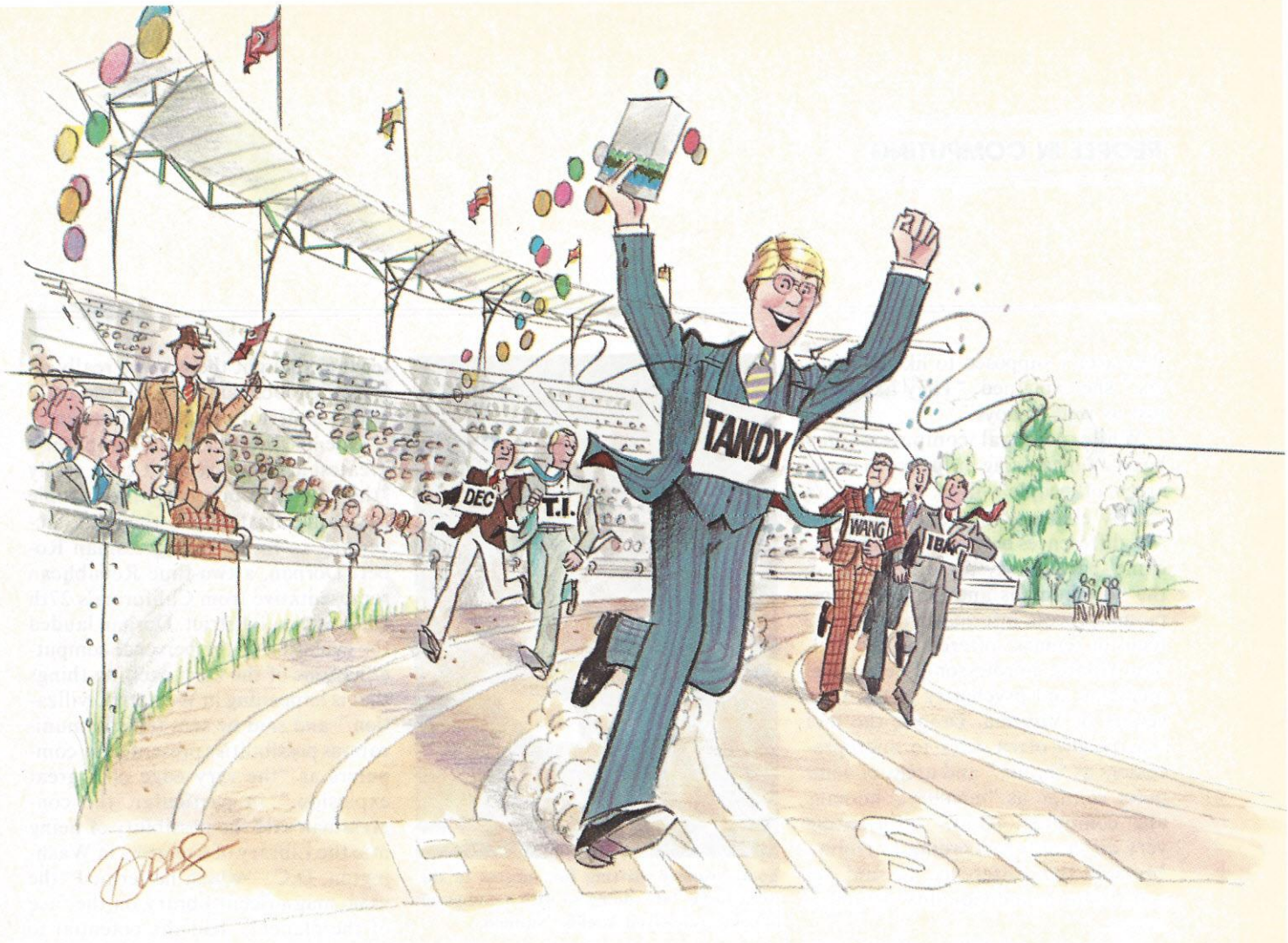
Nussbaum pointed to the possible negative effects of office automation such as a decline in job quality for clerical workers who must respond to a demanding computerized system, a repeating pattern of discrimination in which most high-level, high-paid workers are white males while minority females come in at the bottom of the scale, and the substantial loss of clerical jobs—possibly as high as 20 to 30 percent. "These dangers," she said, "can be turned into opportunities. But whether the future will be Jekyll or Hyde depends on the choices that are made in the next few years."

Health and safety concerns of office workers, specifically eye, muscle and backstrain associated with work performed in front of video display terminals also need to be addressed, Nussbaum insisted. The health area of greatest concern linked with VDT work, however, is that of reproductive hazards, she noted.

Nussbaum, who is also a district president of the Service Employees International Union, cited statistics which put "adverse outcomes to pregnancies"—miscarriages, birth defects or still births—as high as 53 percent in one company where a lot of VDT work takes place. Such large clusters of abnormal pregnancies, she said, could be the result of low-level radiation emitted from the video displays, but she admitted there is little conclusive evidence as to the exact cause. Temporary solutions to the problem include metal shielding of displays, adequate rest breaks and transfers for pregnant workers, said Nussbaum.

The news about personal computers and women is not all bad, however. In some ways, the spread of personal computers has been "a shot in the tail for the women's movement," according to Adeline Naiman, an educational researcher and director of software at HRM Software in Cambridge, Massachusetts. Naiman said the more casual lifestyle sometimes spawned by computer-related work often makes it possible for women to hold jobs on a less traditional schedule, allowing for the care of children, for example. She also noted that computers can help open up new avenues for successful careers for many women. "All the young women I know who are making their mark in the workplace are doing so with a computer in hand," she observed.

Naiman cautioned, however, that "equity of access to computers" must begin early at home and in school in order to prevent young girls from becoming disinterested in science and math later on. "Girls don't know that



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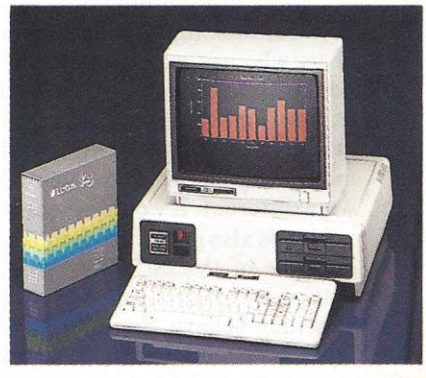

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CIRCLE 87

they aren't supposed to like computers," she explained. "They like them just as well as boys."

While personal computers may boast an increasing influence in many areas of people's lives, one quality clearly eludes computers: humanity. The differences between man and machine, particularly the differences in the way humans and personal computers process information, were the focus of remarks offered by Dr. William Hobbs, a professor of behavioral medicine and psychiatry at the University of Virginia. Despite the fact that people often refer to microprocessors as "brains" and areas of computer storage as "memory," humans and computers handle information very differently, according to Hobbs. Much of that difference, he said, results from the individuality of human beings.

"There are 4.8 billion of us and if you keep looking, you'll never find two of us who are exactly alike," Hobbs noted. "Imagine what it would be like at the Apple Computer Company or at IBM or Compaq Computer if each model coming off the assembly line were different. It would be a disaster."

Hobbs also pointed to families as an example of the different "structures that people create" that help guide the way they behave. Such behavior patterns are constantly undergoing change, he explained, since new sets of guidelines are formulated as two people come together to begin a new family. "It's hard to find a model for this in the world of computing because all of the computers of that model come off the assembly line and are the same," said Hobbs. "If they're not the same, there's a big problem there."

Humans are also unpredictable, which—despite experiences with a computer that might lead people to think otherwise—is not the case with personal computers, according to Hobbs. Unlike what's expected of computers, a "gigantic repertoire of behaviors" is considered healthy in humans while more predictable behavior is usually found only in people suffering from mental illnesses, he noted. Computers, in contrast, are rigidly structured in their performance by design and an "unhealthy" computer is one which is even slightly erratic in behavior.

Young women striving for success in the work force "are doing so with a computer in hand," observed Adeline Naiman.

"When you look at machines such as computers, each implementation is exactly the same," said Hobbs. "You can change the output of the machine based on what software you've installed, but every IBM Personal Computer with WordStar (for example), if it's running properly, will give you the same behavioral output."

Interestingly, people frequently believe themselves to be thinking in much the same manner as computers, observed Hobbs. The linear, sequential process of computers ("I'm going to think about this and now I'll think about this next thing and then I'll think about this third thing") is an extremely logical but quite nonhuman way of dealing with information, he explained. Humans, instead, use a more "parallel" thought process in which they think about many things at once. "If we could develop a computer that thought the way we really do think," Hobbs said, "that would truly be a wonderful piece of equipment."

One of the personal computer's greatest assets—even if it can't really "think"—is to bring together people to communicate their thoughts, according to former Congressman Robert Dornan, a two-time Republican representative from California's 27th congressional district. Dornan lauded the evolution of the personal computer as "one of the most exciting things that is happening in Western Civilization" and said he sees the communications possibilities presented by computers as "the very edge of a great explosion." In particular, the congressman said the possibility of tieing into the Library of Congress in Washington, D.C.—which he termed "the most magnificent library on the face of the planet"—had the potential to bring people closer to what is going on within the workings of government.

"Somebody who is on the ground floor now with personal computers will be able to talk to their congressman or congresswomen's computer and have the most unbelievable knowledge available at their fingertips," said Dornan. "Only the invention of the wheel or the industrial revolution can compete with what's going to happen when a fifth grader has a personal computer and is able to plug into the Library of Congress. It's incalculable what it will do."

Other participants in the *Personal Computing* Forum included Herbert Scholl, an assistant director with the Securities and Exchange Commission; Michele Preston, vice-president for the investment banking firm of Rothschild, Unterberg & Towbin; Matthew Puleo, vice-president of Yankelovich, Skelly & White, a market research group; Roy Tally, an education technology specialist with the Minnesota Board of Education; and Rick Weingarten, manager of communications and information technologies at the Congressional Office of Technological Assessment.

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In ***Track And Field***[3] you can compete by yourself or head-to-head with another player. But each player must beat qualifying times, heights and distances before they can compete in each of the gruelling six events.

Typo Attack is the much-acclaimed, fun-filled program that allows you to enjoy developing your typing skills at any level.

And still playing to the delight of audiences everywhere are ***Pac-Man***[4]; ***Ms. Pac-Man***[4]; ***Jungle Hunt***[5]; ***Battlezone***™; ***Donkey Kong***[2] by Nintendo[2]; ***Centipede***™ and ***Pole Position***[6].

So, if you've been searching for ways to entertain your Commodore, Apple or IBM, treat it to one of the best shows in town, one of the hits from ATARISOFT.

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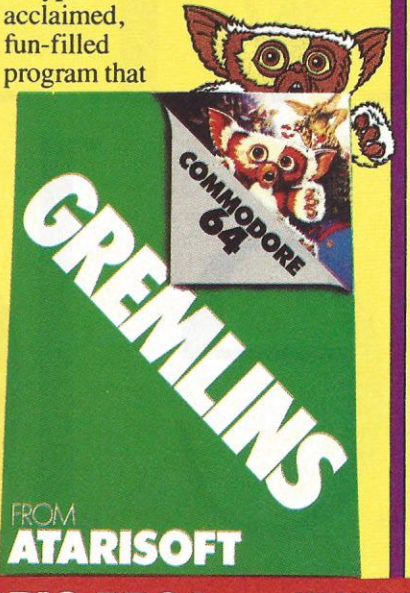

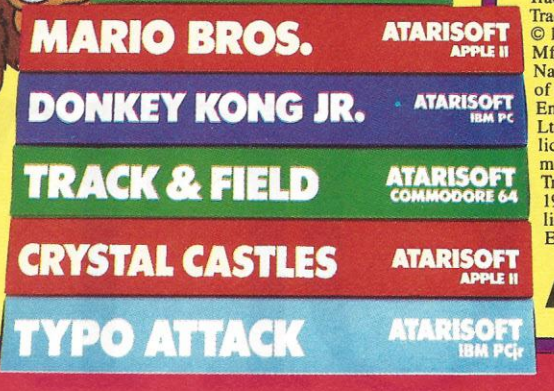

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*Titles available on IBM PC jr. are Ms. Pac-Man, Centipede, Donkey Kong, Moon Patrol[7] and Typo Attack. Available on the VIC 20 is Typo Attack.

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CIRCLE 38

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CIRCLE 64

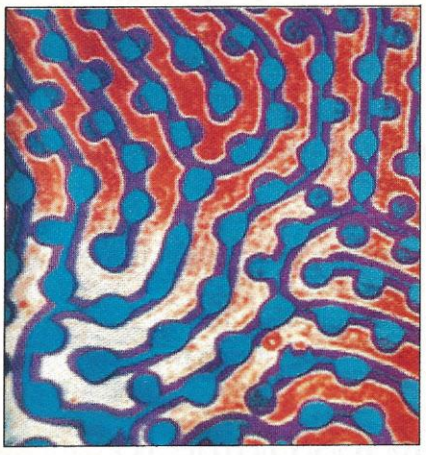
The New World Of Photomicrography

There was a time when Len Stern thought he was missing out on events which were shaping society. As a photographer in the armed services during World War II, his hobby was transformed into an avocation and meal ticket after the war.

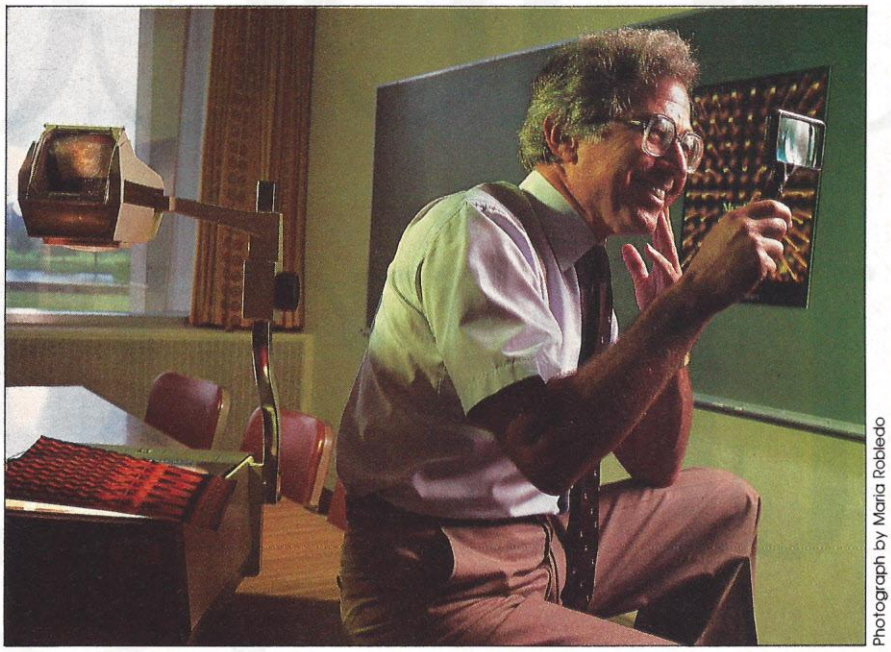
"Originally I had hoped to work for *The New York Times*," he says. "But I ended up stringing for some newspapers and wire services and then worked for the photographic organization of the New York/New Jersey Port Authority."

Twenty-three years ago, AT&T offered him a job in its photographic department and Stern has been there ever since. "I went with AT&T thinking that I had missed out on the photographic events which were shaping society," he says. "But AT&T has given me a window on the world of technology which is having an enormous impact on society." It's become a broad picture window with a breathtaking view of revolutionary advances in technology.

Stern, 57, is currently the director of photography for AT&T Technologies and the coordinator of an impressive photographic collection called: "MicroScapes: The Hidden Art of High Technology." "MicroScapes" is an exhibit which focuses on the seldom seen world of advanced developments in microelectronics and lightwave communications. The exhibition of 47 photos taken by Stern and AT&T Technologies scientists and researchers has been on exhibit across the nation since last October.



Stern's photo of a bubble memory pattern is part of "MicroScapes."



Photograph by Maria Robledo

As director of photography for AT&T Technologies, Len Stern coordinated the compilation of "MicroScapes: The Hidden Art of High Technology."

The photos represent some of the current devices (integrated circuits, memory devices and manufacturing processes) used by AT&T Technologies in the research, development and production of advanced communications systems. The photographers used a number of techniques including: optical photomicrography, interferometry, photomacrography and thermography. Optical photomicrography is the process of making greatly magnified photographs of minute subjects through a compound microscope. Photomacrography makes moderately magnified pictures of small objects. Thermography is the process for imaging variation in the amount of radiation or heat emitted by an object, and interferometry is the technique used for visualizing invisible density variations in a disturbed medium.

"We are at the beginning of a very different and unusual technology," Stern says. "Most technology is standard, but the information and communications technologies have come about as a result of growth that is largely invisible—no one has a clear, definable image of it.

"I've been looking at this world for some time now, it's exciting to explore it as an art medium," he says. "I began to collect some of the photos and a lot of people expressed an interest in doing something productive with them."

The 47-photo exhibit was put together over a two-year span. Then Stern contacted the Association of Science and Technology Centers in Washington, D.C. for support. "They were delighted to offer their member museums as places to show the exhibition," Stern said.

Photos in the exhibition include: a 256k chip photographed by Phillip Harrington using the photomacrographic technique; connector pins of a

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CIRCLE 66

plug-in circuit taken by Charles Lewis using photomacrography; and a magnetic bubble memory pattern photographed by Stern using television enhanced photomicrography with polarization. Many of the "MicroScapes" photographs display the material used in high technology products. Gold, sulfur, copper and aluminum are among the materials used. Other photographs illustrate the manufacturing processes involved, such as electro-deposition of gold and copper, plasma etching of silicon wafers, irradiation of silicon by laser and the joining of materials by explosive bonding. Also represented is the process of soldering. One of the oldest methods of joining metallized surfaces, soldering is currently a highly developed technology that forms a critical step in the production of the electronic circuit packs.

"We used very specialized techniques, it was a discovery process," Stern says. "In the case of electrodeposited gold, we looked at the element under an electron microscope and it really looks like a giant cauliflower. You look at the image and just let your imagination run wild."

The images were fed into a Quantel colorizer which attributes the differing colors to various shades of gray and tells the researcher what color delineations to attribute to the images. Some of the photos were shot at exposure speeds of 1/720,000th of a second and with magnification of 67,000 times the actual image size.

Stern has come a long way from his days as a stringer chasing photographic jobs the length and breadth of New York City to directing the photographic projects at AT&T Technologies, a job which includes oversight of a full stable of corporate publications.

"I really believe that corporate journalism is the place to be," Stern says. "There's a new jump in technology every 18 months. AT&T has given people a window on the world of technology which is having an enormous impact on society."

More Champions To Follow

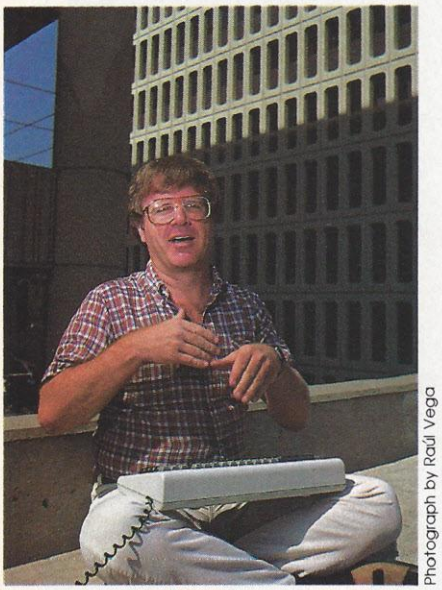
As the 1984 Summer Olympic Games in Los Angeles go down in the books as history, another international athletic competition to be held in Los Angeles is just gearing up. The World Games for the Deaf, also held every four years, is scheduled to take place in July 1985 in Los Angeles.

Begun in 1924, these Olympic-like games give deaf people all over the world the opportunity to compete against one another in athletic events. The summer games are held the year following the regular Olympic competition; the winter games take place the following winter. (The next will be in 1986.)

As in Olympic competition, athletes from all over the world gather to compete in a multitude of events. "We have to follow all the international rules, the same as in the regular Olympics," says Debbie Green, office manager of the Los Angeles Organizing Committee for the World Games for the Deaf. "The equipment and the sites all have to satisfy the international requirements. Where we would differ," she says, "is we have to have starting guns connected to strobe lights for track and swimming events so the athletes will know when to start."

Next summer, 1200 participants from 41 nations are expected to compete in 144 events, involving 13 sports. More than 50,000 spectators will attend. "That may be small in comparison to the Olympic standard," says Edward Ingham, who works on special projects for the games' organizing committee, "but we have more nations represented than any other 'Special Olympic' body."

Ingham speaks through an interpreter; he is deaf. Like almost all who are involved with organizing the World Games for the Deaf, he volunteers his time to the cause. "I've always been interested in deaf people in other countries," he explains. "I have many deaf friends all over the world, so I felt it would be good to be involved in helping make the World Games for the Deaf successful. So here I am."



Photograph by Raúl Vega

Edward Ingham volunteers time in the special projects area to aid in organizing the World Games for the Deaf.

In addition to giving his time, Ingham also volunteers his computer expertise. A Ph.D. student at UCLA majoring in educational psychology, he has owned an Apple II personal computer since 1979. He also worked for several years for IBM research labs, and has a "very strong systems background."

That expertise comes in handy around the World Games for the Deaf Organizing Committee's office. The staff has three Kaypro II personal computers and one minicomputer, to help run the day to day office operations. Ingham, along with another volunteer who has owned a personal computer since 1971, is available to help the rest of the staff learn to use them. Since most of the people on the organizing committee are deaf and know sign language, "There's no problem teaching them," Ingham says.

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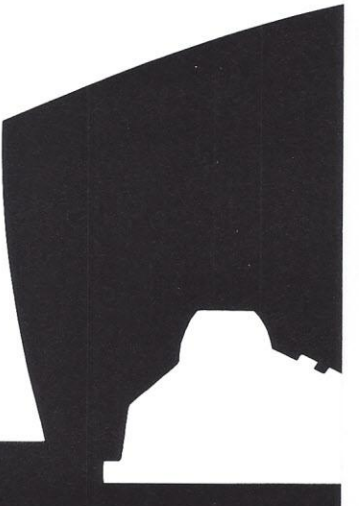

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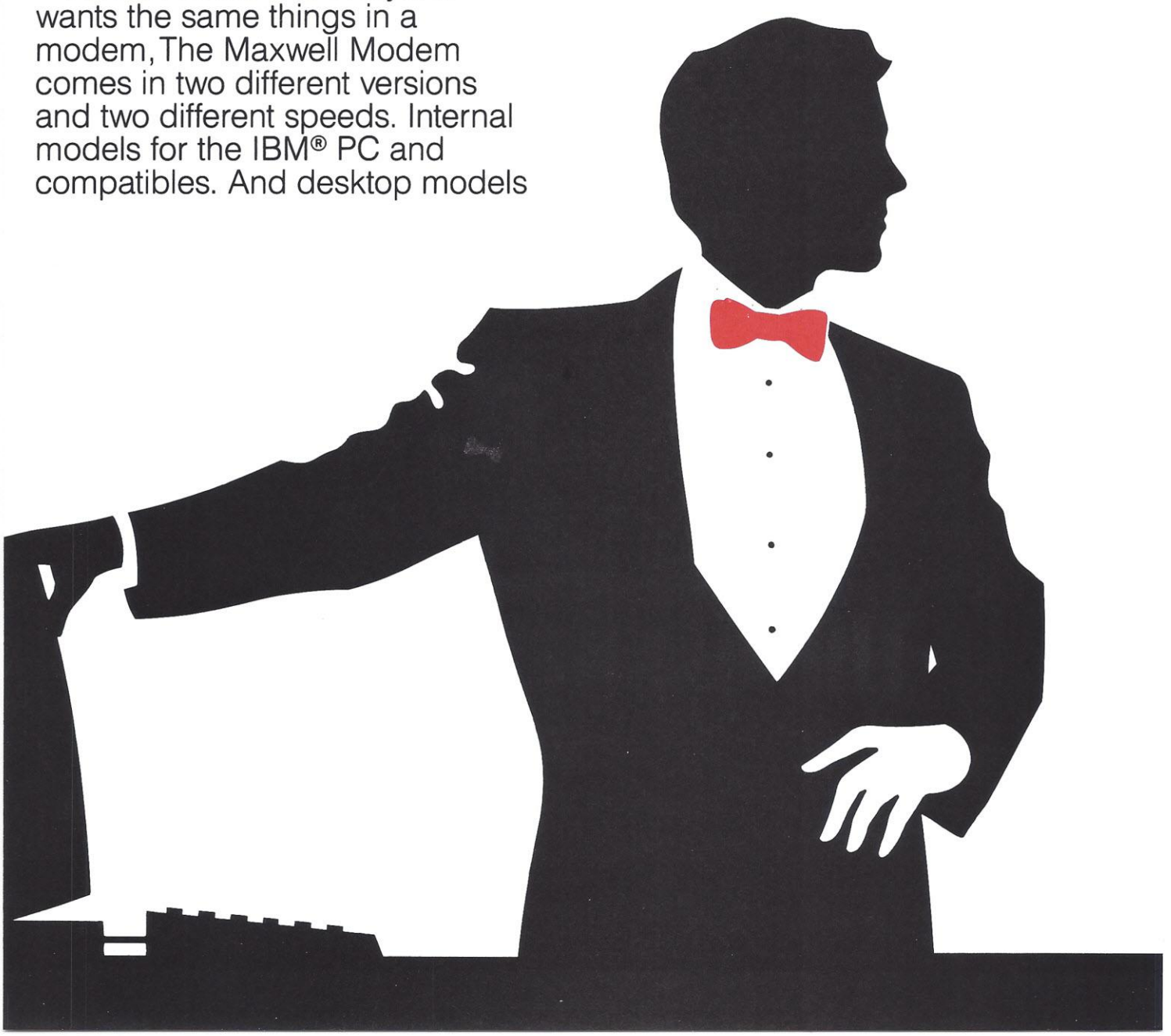

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The computers are used for many of the same functions any office finds for a computer: word processing, electronic mail, spreadsheets to plan the budget. But there are also a few unique needs of an organization like this one that the computer answers.

With all the sports, events and participants to keep track of—not to mention the three different sites at which the games will be played—there is a real need for information management. The organizing committee uses dBASE II, a relational data base program, to help. They use the program to keep address listings of people who will be participating in the games, those who will be attending, a schedule of the games themselves—and more.

When the games are actually taking place, the program will help even more. According to Ingham, "We'll link names of people to their 'places' (first, second, etc.) and the games schedule. For example, when someone wins an event, we will type that person's name and what place that person came in, into dBASE II. dBASE II will search for more information on that person. It will search for the previous world record for that event."

Though it's not a common occurrence, "We have set world records before," Ingham says. "We will want to know if someone broke the old record so dBASE II will check that for us. And after updating the results for the day, we will print out a list of the results that we will post.

Computers will be at the site of every event to update the results throughout the games. Those results will then be telecommunicated, through modems, back to the organization's headquarters to be tabulated.

"The World Games for the Deaf is both a cultural and a sporting event," Ingham says. "We'll have performing groups from all over the world—deaf people giving performances to other deaf people. It's not hard for the deaf from one country to understand the deaf from another.

Both the culture and the athletic experience of the games "will pull deaf people of the world closer together," Ingham says. And that is what the Olympic spirit is about.

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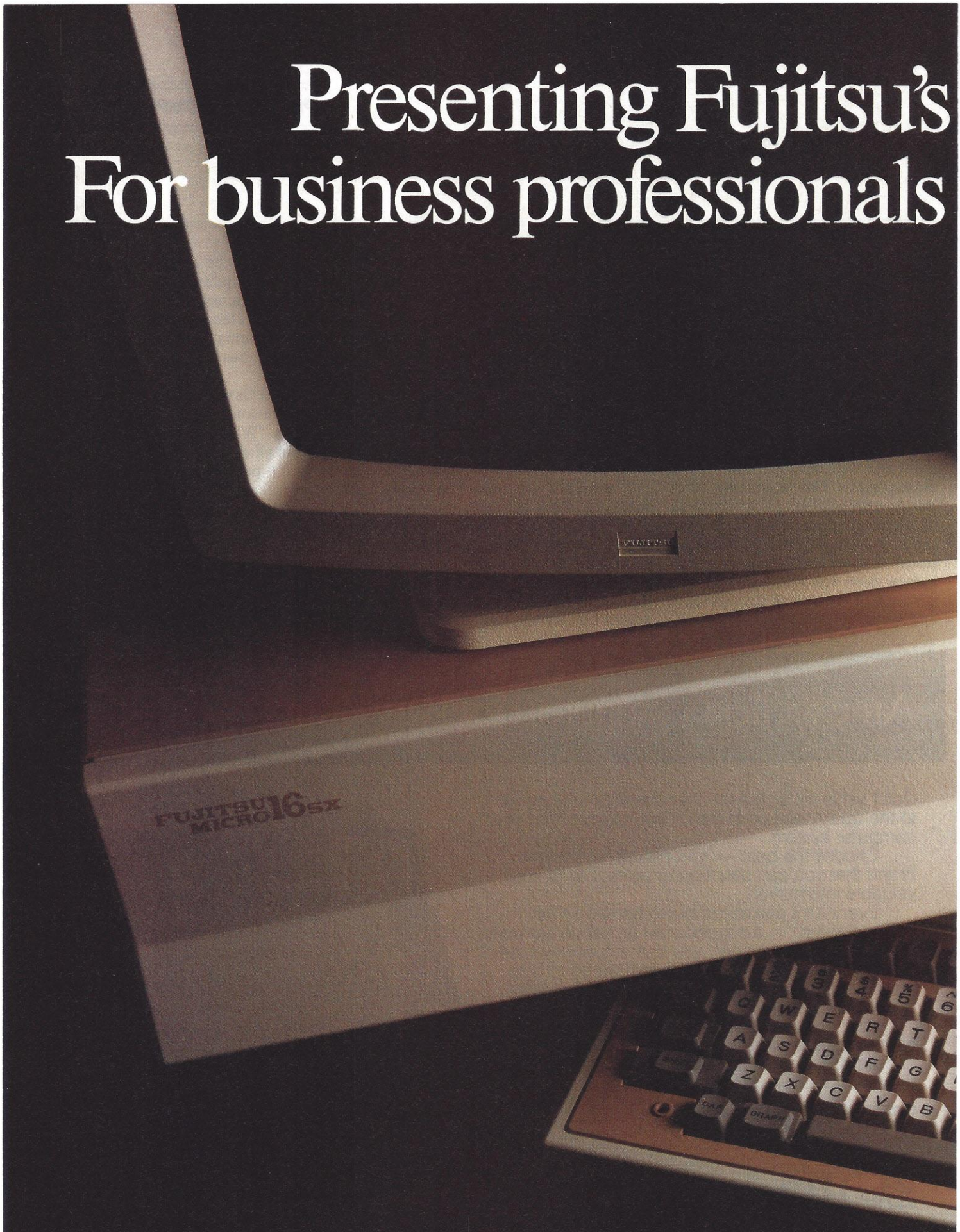

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CIRCLE 85

SPECIAL REPORT

Computers In Education: Promise And Reality

Computers may yet save our schools, but not without careful planning and effort to overcome the problems that plague computer education

by Paul Bonner, Senior Editor

"We appear to be raising a generation of Americans many of whom lack the understanding and the skills to participate fully in the technological world in which they will live and work." That comment, from a recent United States Department of Education report entitled "Computers in Education," *echoes the sentiments of concerned business leaders, educators, parents and government officials at every level.*

One obvious way to prepare young people for the technological world is to bring some of that technology into the schools in the form of computers. Indeed, the potential advantages of using personal computers in the classroom are hard to deny. By making computers a familiar fixture in the classroom, educators may help today's students avoid the technophobia that often plagues their parents. And by integrating the computer into the learning process, they can take advantage of its capabilities as an instructional tool.

But behind the convincing and, for the most part, sound arguments for bringing computers into the classroom loom some major problems. Who will fund—and therefore control—the acquisition of computers for the schools? How should they be used once we have them in place? How will they change our educational system? And how can we ensure equal access to this technology for all students, regardless of socioeconomic factors?

These questions are easy to ignore in the rush to put computers in the classroom, but they are present and growing in importance every day. How they are answered will have a tremendous impact on the future of education in this country. These questions, and what answers have emerged, are the subject of this Personal Computing *Special Report, which begins with a status report on computers in our schools and includes an essay by Ernest Boyer, president of the Carnegie-Mellon Foundation for the Advancement of Teaching, and an interview with Senator Frank Lautenberg , whose bill, the Computer Education Assistance Act of 1984, seeks to establish a program of federal assistance for computer education in the nation's schools.*

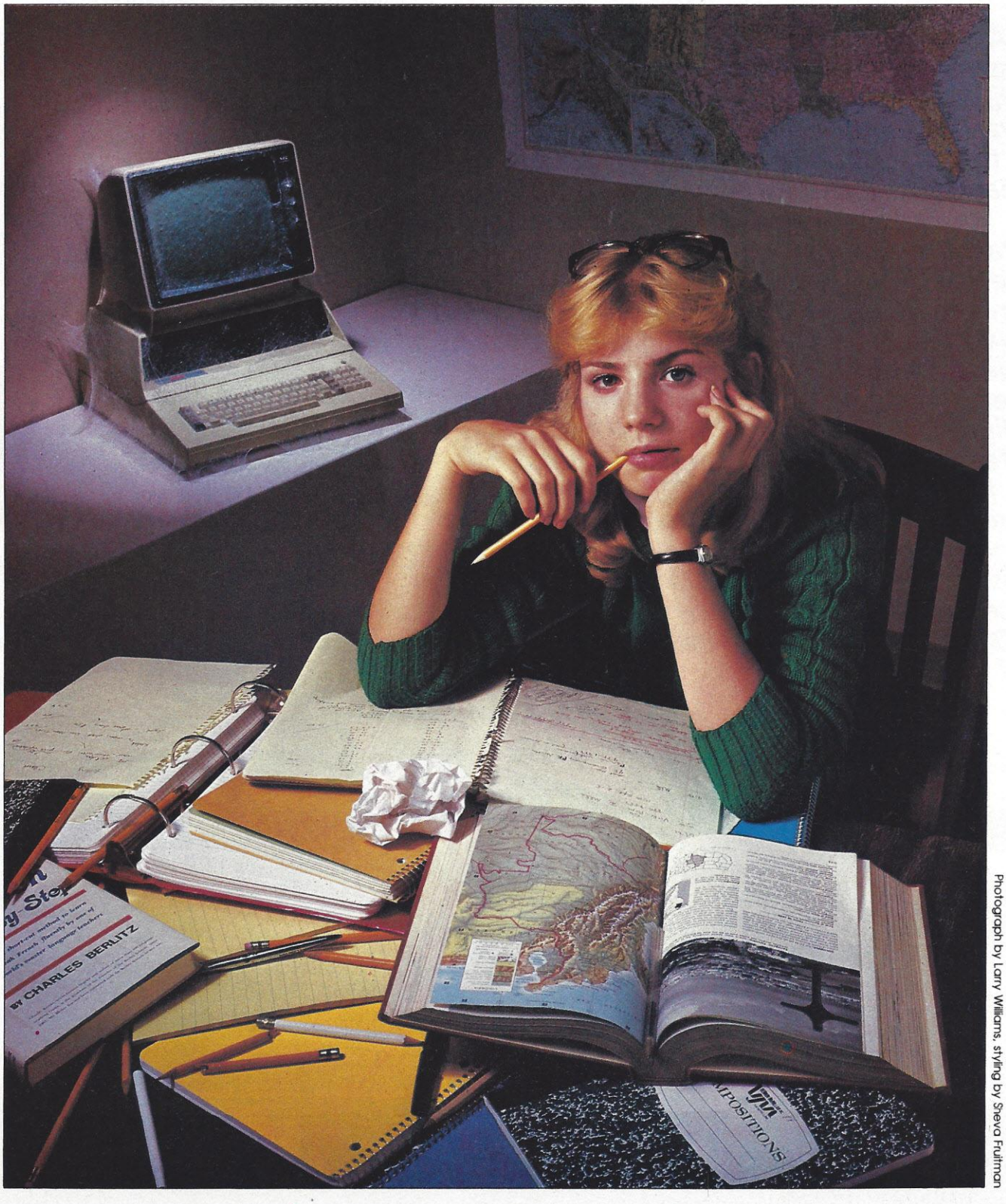
On the face of it, the outlook for computers in education is encouraging: The number of personal computers for instructional use in public elementary and secondary schools has risen from 31,000 in 1981 to 325,000 in 1983 and is expected to double in each of the next five years, reports the National Center for Education Statistics. These figures, along with reports of the exemplary success of computers in model schools around the country, suggest that the integration of the personal computer into the American school system is well underway, and that left to its own devices, it will flourish.

But isolated statistics and preliminary reports from model schools don't tell the whole story.

"Although more than half the nation's schools have at least one microcomputer, that is also the most that a large number of these schools have," says Sen. Frank Lautenberg, one of the leading proponents for a national policy on computers in education. "Relatively few students get any computer instruction," echoes Linda Tarr-Whelan, director of government relations for the National Education Association. "In most of our schools where computers are present, this equipment is reserved for administrative uses or for the classes of only one or two teachers—generally those who actually teach computer skills."

For a nation that prides itself on educational excellence, the failure to take full advantage of the personal computer as a powerful learning tool is disturbing. Lured by the promise of the new technology, we have sidestepped the problems inherent in integrating it with proven, traditional methods. Now we're paying for that shortsightedness with wholesale misallocation and rampant misuse of computers in our schools.

"The potential for computers to improve education is enormous—more



Photograph by Larry Williams, styling by Sheva Fruitman

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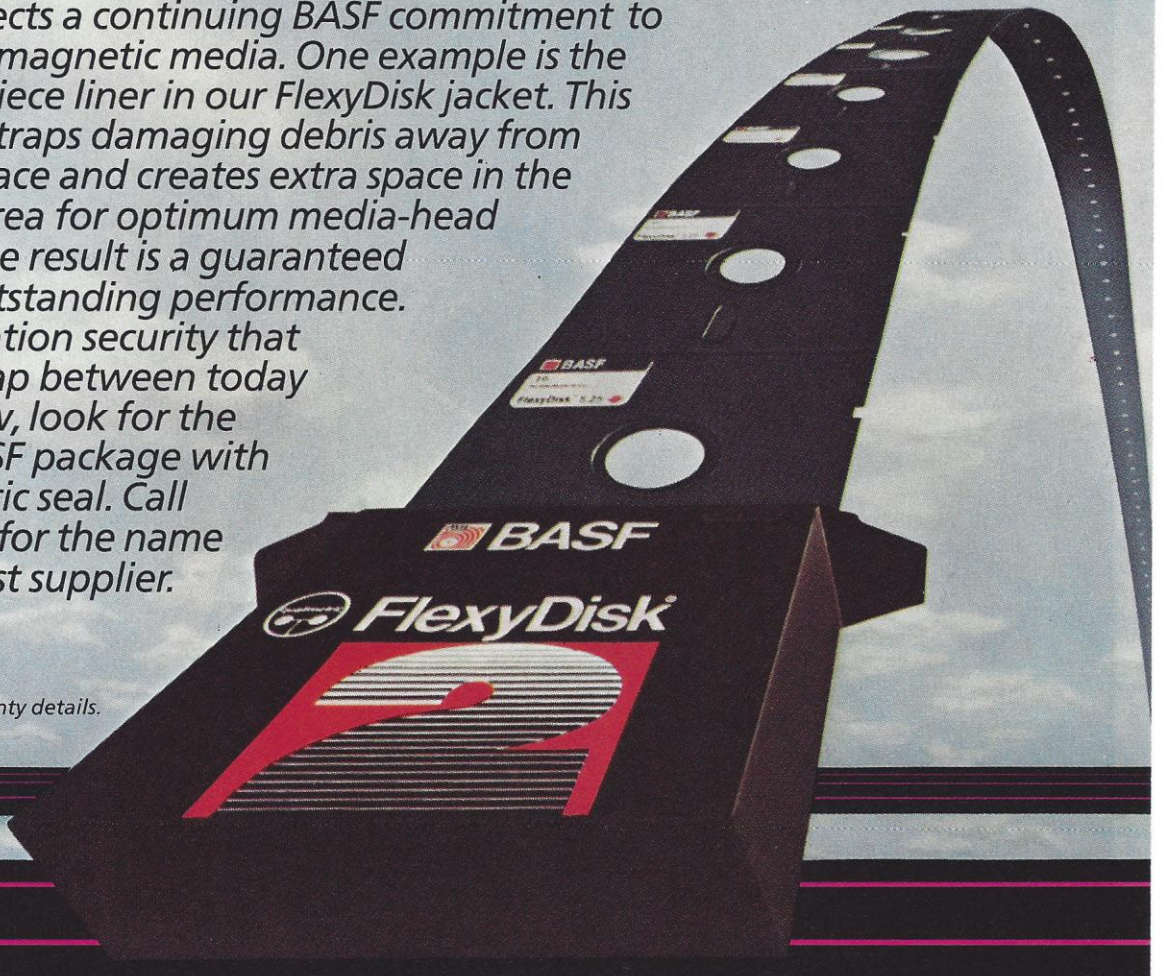

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CIRCLE 7

"Our schools are being swept up in a wave of technology without any idea of how to make wise use of it."

dramatic than any invention since writing," according to Rep. Albert Gore, Jr. (D-Tenn.), the author of the National Educational Software Act of 1984. "Yet that potential is not being met. Simply put, our schools are being swept up in a tidal wave of technology without any idea of how to make wise use of it."

"There is no reason to believe that simply providing the schools with microcomputers will do much to improve education," says F. James Rutherford of the American Association for the Advancement of Science. "Indeed the thrust of our experience in the United States gives us every reason to believe that doing so will mostly be a waste." Citing the disappointing results that followed the much ballyhooed introductions of film projectors, televisions, language labs and other technological innovations to the classroom, Rutherford says, "Our failures in the past have had to do less with overestimating the power of new technologies than with underestimating the effort necessary to exploit that power."

Rutherford's comment may be the key to understanding why computers are not being effectively exploited within the school system, for the effort he speaks of is not inconsiderable. It's a major undertaking that must begin with adequate planning and funding of computer purchases and must extend through curriculum development and teacher training. If any of these links is weak, the result will be less than successful. Unfortunately, there are weak links all through the process of integrating computers into American education. The process has to date been haphazard, with little cooperation between educators, government and private sector companies, and little agreement on how such a new technology should be brought into schools and how it should be used once it is in place. The lack of precedent and policy has resulted in a host of problems which are delaying the successful integration of the new technology into the traditional educational system.

NEA's Tarr-Whelan cites "the lack of computer availability, limited curriculum development, inappropriate or unobtainable software, the absence of teacher training and the competition for computer time for administrative chores" as factors which have "severely limited the usage of this potentially valuable machinery."

Testifying before the House Subcommittee on Science, Research and Technology during hearings on several pieces of legislation related to the use of computers in schools, (see *Will Legislation Help?* accompanying this article for more information) Rep. Gore outlined the major obstacles to effective use of computers in education as follows: "1) Computer hardware is not yet widely available in the schools ... and what equipment is available is not equitably distributed; 2) Teachers are not being adequately trained in how to use computers and plan for their integration into standard coursework; and 3) High-quality educational software is almost nonexistent in our primary and secondary schools."

Availability

In spite of the growing number of computers in the school system, availability remains a problem. Even if the predicted figures for computers coming into schools are met, it will take years for the technology to reach the 40 million students in the nation's 85,000 public schools.

Part of the problem lies in the lack of a cohesive policy for bringing computer equipment into schools. *School Uses of Microcomputers,* a report issued by the Center for Social Organization of Schools detailing the results of a 1983 Johns Hopkins University survey, showed that before 1982, "the initial impetus for obtaining micros most often came from a single teacher. More recently, administrators have been playing a larger role in initiating first purchases." The study also shows that the way computers are used in schools varies according to who played the leadership role in acquiring them, noting, "where a single teacher dominates acquisition and implementation in elementary schools, micros sit idle more often, and, when used, are used primarily to teach computer programming and with faster-learning students."

The funding for computers in schools comes from a diverse, and often haphazard, group of sources, including special grants, general school system funds, donations from manufacturers and fund-raising efforts initiated by the PTA or teachers. Few schools can afford to purchase computer equipment through their regular budgets, and those that do, according to the Johns Hopkins survey, "tend to have a poorer (higher) ratio of students per computer than do schools that obtain district or grant funding." The study states that in about one-third of the schools with computers, more than 40 percent of their cost came from special grants. Further, in 22 percent of elementary schools, parent/teacher associations and fund-raising activities have provided a substantial portion of the cost of personal computer equipment.

Teacher leadership has also been important in the actual funding of computers for schools. "In a lot of cases the teachers are the ones who go out and turn up the money," notes Joe Ioni, staff development coordinator for the division of curriculum and instruction of the New York City public school system. "We have those who are great grant writers who go out and get grants from Radio Shack, and those who run cake sales, candy sales and bike-a-thons to get computers into the schools."

Some regions have also benefited greatly from donations of equipment from computer manufacturers. In California, for instance, which gives special tax incentives to computer manufacturers who donate equipment to schools, Apple Computer

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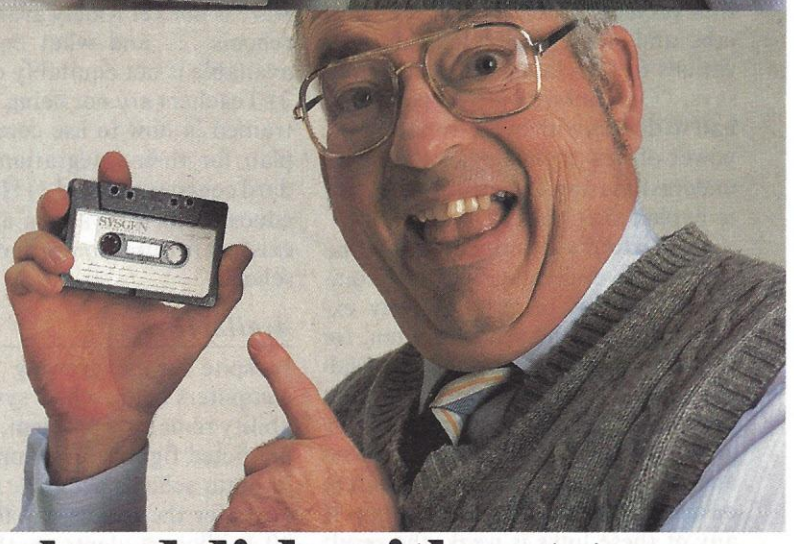

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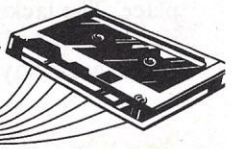


Getting computers into the schools is only the first part of the complex equation.

Corp. has offered a complete system to every school and to date has given away approximately 9250 systems worth $20 million. Other manufacturers who have made major contributions to computer education include IBM, which has donated 1500 personal computers to schools and colleges in New York, Florida and California, and Tandy/Radio Shack which has given 20 one-hour training courses to an estimated 150,000 teachers. As impressive as donations of this type are, the Johns Hopkins study noted that they had provided a substantial percentage of the computer equipment in use in less than six percent of the schools with computer education programs.

Curriculum

But getting computers into the schools is only the first part of the complex equation for their successful use in education. An equally urgent problem faced by educators is developing curricula which integrate the computer and take the fullest advantage of its potential as a teaching tool. Since the technology is so new, there are no real precedents for its use alongside traditional teaching techniques. "We don't know very much about how to use computers to teach," Paul Horwitz of Bolt Beranek and Newman, Inc., (designers of the Logo language), told the House Subcommittee on Science, Research and Technology. "That is why there is so little good software out there . . . because we don't yet know how to produce good software. That is why teacher training is so hard . . . because it is hard to learn how to teach with (a computer). That is why we don't just need hardware in the schools—we need software and, even more important, we need curriculum. We need computer-based activities that work in the classroom."

According to the Johns Hopkins study, the most common uses of computers in the classroom are for "Introduction to Computers" courses and programming instruction. Yet, most educational leaders argue that computer education will only become effective when it is integrated with the traditional school curriculum. Dr. Mary Alice White, director of the Electronic Learning Laboratory at the Teachers College of Columbia University in New York City, says, "The most advanced school systems are the ones that have moved away almost completely from the computer literacy approach and the programming language approach and use the computer as a learning tool. They don't have a computer lab anymore, they put computers in classrooms and let kids use them as an electronic pencil."

Ken Brumbaugh, executive director of the Minnesota Educational Computing Corp. (a non-profit corporation established by the State of Minnesota), agrees, saying, "I'm not an advocate of some special course called Computer Literacy, that grossly overused, dumb phrase. Only those things that are integrated throughout your total learning experience stick with you. The key for children is to understand what the computer can do and does do. If the computer is used routinely throughout their school experiences they will have that general understanding."

"People said, 'We need computers and we'll teach this computer course.' Generally what they did was teach programming," Brumbaugh adds. "Well, how many people need to know programming? It wasn't an error as much as it was a first step. The second step is the curriculum planning and the integration. How we use the computer has to evolve."

Part of that evolution involves greater attention to educational software. In the rush to get computers into the schools, too much emphasis has been placed on the hardware, with limited thought devoted to the actual teaching tool—the software. Educators blame software publishers for the lack of quality educational software. "Most of the software out there isn't that good," says Ioni. "Our office is a software evaluation house (for New York City public schools). Individual schools cannot buy software unless it's approved by our office. We probably have the largest data base of software in the world. We've identified maybe 200 programs (as useful) out of the 10,000 programs that are out there for education."

Columbia University's White feels that the shortage of good educational software can be partly attributed to market forces. "Textbook publishers are used to talking big bucks in terms of textbooks and they don't quite yet see the software market growing into the kind of market they're used to," she says. "They go to a central agency that buys textbooks and they're asked 'Do you have computer software to go along with your text series?' because most state purchasing agencies want it. So a lot of publishers are putting out what you might call a complementary software line to go along with their series in order to get the (textbook) sales to the state."

The problem with that approach, White feels, is that "whenever you invent software to complement text you're in trouble. It's not a complementary medium. I think it's an independent and different medium. And I think the moment you start throwing text up on the screen you've got problems. But that's the way textbook publishers tend to think, they tend to be printbound. That's what they've done for a long time. They don't want to threaten their existing line and I understand that, but I think you're not going to get a lot of computer software in schools until the medium is thought through for what it can do well—and designed for that.

"How people learn from software and videotapes is quite different from how they learn from print," White adds. "The assumption often is made that it's just the same thing. It's not. When you learn from an electronic source you learn with a large amount of imagery and much less print. Imag-

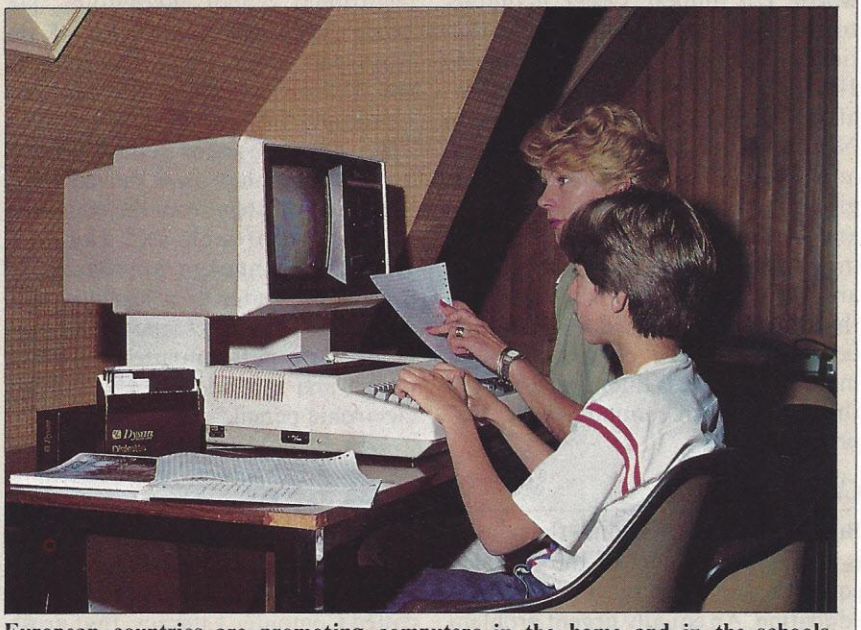
CLASSROOM COMPUTING: A EUROPEAN PERSPECTIVE

The United States is not alone in its struggle for effective educational computing. The major European countries also face lack of funds, shortage of quality educational software and a general absence of national policy and standards for the use of computers in education.

The decentralization of computer acquisition makes it difficult to estimate the number of computers actually in use in European schools. In France, for example, the official figure for computers in schools is given as 8000. The actual number, however, may be as high as 30,000. The discrepancy is the result of fragmented purchasing policies; the official figure takes into account only those computers purchased through a special subsidy from the Ministry of Education. Further, this figure does not include French private schools, which comprise almost 40 percent of the schools in France. Nor does the figure account for computers funded by individual school budgets or for equipment purchased by teachers who actually pay for the computers out of their own pockets.

One result of this haphazard acquisition of computers for educational use is that in a market supposedly "protected" against non-French hardware, the Apple II is the market leader with an estimated installed base of 10,000 machines.

On the software side, the market in France is in its infancy, with an estimated 400 programs now available. The business is dominated by two publishers; Vifi-Nathan develops most of its own software, which is aimed at children ages 4 to 15 and runs largely on the French Thomson home computers. Ediciel, on the other hand, translates American-made educational software and games, (including Spinnaker programs), for the Apple II family of computers. French educational software offerings run the gamut from shape recognition and preschool skill-building packages for young children, to programs that combine games with educational value, and some purely educational packages which concentrate on traditional subjects such as math, science, and language skills. But the number and variety of commercial programs available is still limited, particularly in the areas of reading and literature.



Photograph by Jean-Philippe Ballard/Publi 12

European countries are promoting computers in the home and in the schools.

The French government is aware of the urgent need to bring computers into the schools and has initiated several programs to step up the process. Project Diane, initiated by the Computing Agency (l'Agence de l'Informatique), a branch of the French Ministry of Industry and several software publishers, is an attempt to provide software which allows users to create their own educational programs for their children or students. The Diane floppy disks will be available for any CP/M systems within the next year. Unfortunately, the programs will not run on IBM Personal Computers or compatibles, or on Apple computers, but are only usable on three French computers. This attempt at market protection cuts out a large number of computers already in use in France.

In its efforts to promote national awareness of computing issues, the French government has taken its lead from Britain, where 98 percent of the schools are equipped with personal computers. (Britain also boasts an installed base of 1,550,000 computers, as compared to France's 250,000, and West Germany's 220,000). In 1981 British Prime Minister Margaret Thatcher made educational computing a national imperative by proclaiming that all high schools were to be equipped with a personal computer before the end of 1983 and all primary schools before the end of 1984.

Efforts to raise Britain's computer awareness were aided by a BBC television series which dealt with the BBC Acorn, the Sinclair ZX-81 or the Link 480 and encouraged the use of these computers in the viewing process. This September, France will pilot a similar television series which will feature the Thomson TO7 and MO5 computers. The French government has also launched a national campaign entitled "100,000 Computers In The Schools," which also revolves around the Thomson computer. The aim of the campaign is to have 100,000 computers installed in French schools by the end of 1985.

—Nora Georgas

Research: Frédéric Krivine, Temps Micro

ery varies enormously from print: It's not sequential, which print is, it's not organized in the usual print form by topic sentence, paragraph and so on. Nobody really knows how pictures are stored in one's head, but clearly it's not in the way that words and print information are stored."

Predictably, educational software developers disagree with educators' assessments of available software. In testimony before the House Subcommittee on Science, Research and Technology, Harry A. McQuillen, president of CBS Educational & Professional Publishing, claimed, "Over the last year the quality of educational software being published has improved dramatically." Estimating that the combined investment of major publishers in the field of educational courseware was $100 million a year, McQuillen added, "The educational software market is maturing quickly and that maturation process is producing a new generation of software far superior to the inadequate drill and practice software (seen in the past)."

Tarr-Whelan of the NEA supported McQuillen's statement that the quality of educational software is improving in her testimony before the Subcommittee, saying, "The lack of high quality software has been a major frustration for teachers ever since the microcomputer first started appearing in classrooms, but that situation is rapidly changing. As the number of computers in the schools has increased, so too has the availability of courseware. The marketplace seems to be working."

Irreversible trends?

Unfortunately, the improvement in educational software may be too late to reverse some trends that are clearly counterproductive to the goal of integrating computers with the curriculum. According to the 1983 Johns Hopkins study, "In schools that obtained a microcomputer before July 1981, nearly two-thirds of the secondary and one-third of the elementary teachers who said that the micro was originally viewed as a 'tool' (to help them teach basic skills in non-computer subjects) now view it as a 'resource' (for students to learn more about computers). In contrast, only about 10 percent of those who initially viewed it as a 'resource' now consider it primarily a 'tool.'" Noting that the "movement toward 'resource' is less apparent among schools that obtained their first microcomputer more recently," the authors of the study suggest that one possible explanation for this is that "the 'pioneer' schools became disenchanted with the drill and practice software available at the time and have not ventured back to examine more recent software products which schools who more recently became microcomputer owners have been able to use at least somewhat successfully."

> *"A lot of money is being wasted at the state level. They're just not looking at courseware reviews."*

Side by side with the inadequacy of much educational software is the task of evaluating programs to select the ones that are adequate. "The only way to solve the problem is to make selected courseware available to the end user (teacher) for his or her own evaluation," says Brumbaugh of Minnesota Educational Computing. "What we need is a published Top 50 or Top 25 in each selected discipline or level of education so that the states or regional centers could figure out ways to make those products available for end user sampling or trial. An awful lot of money at state levels is being wasted. They're just not looking at the courseware reviews or evaluations that exist, they're not plugging into electronic networks to access those reviews, they think that each state or perhaps service center needs to replicate or duplicate or conduct their own review."

Another major roadblock in the path of effective computer education, and one of the most frequently overlooked, is teacher training. "As publishers working with classroom teachers on a daily basis, we have concluded that the lack of teacher training on micros is the biggest single impediment to their use," CBS's McQuillen told the House Subcommittee. "There is neither an existing structure nor one on the horizon to provide this training."

Part of the reason for this may be that the need for teacher training is only becoming apparent as computer education programs are becoming widespread. Many of the first computer education programs were started by individual teachers who got the pioneering spirit and trained themselves. "Teachers have been very good about learning about computers more or less on their own," Columbia's White notes; however, "to expect a whole generation of teachers to suddenly acquire computer skills is a bit much."

Efforts to rectify this problem are now underway across the country. California, Virginia and Minnesota have started teacher training programs designed to familiarize teachers with computers and colleges of education are beginning to institute training in this area. However, the problem of teacher training is a large one and is unlikely to be solved overnight. In New York City, for instance, Ioni's staff of four is charged with setting up centers to train some 70,000 teachers in the use of computers. "We've already trained about eight or nine thousand teachers," he says, but notes, "we don't have enough hardware in our training centers. We've been lucky enough to find

WILL LEGISLATION HELP?

This year several bills designed to address the problems that have slowed the effective use of computers in schools have been introduced in Congress. These include the Computer Education Assistance Act of 1984, introduced in the Senate by Senator Frank R. Lautenberg; the Computer Literacy Act of 1984, introduced in the House by Representative Timothy E. Wirth; and the National Educational Software Act of 1984, introduced in the House by Representative Albert Gore, Jr.

The bills introduced by Lautenberg in the Senate and Wirth in the House are similar in nature. In fact, the second and third parts of the two bills are identical. The second part of each calls for funds to train teachers in the operation and use of new technologies and the third provides for funds for the evaluation of computer-related technology and the development of model software. The differences between the two bills come in their first parts, dealing with Federal aid to local school districts for the purchase of computer hardware. Lautenberg's bill provides for four years of funding at $150 million per year (with an automatic three-year extension), while Wirth's bill calls for "such funds as may be necessary" in order to provide each public school in the country with one computer for every 30 students over a three-year period. (A Congressional Budget Office estimate suggests that the cost of the program outlined in Wirth's bill would be $717 million per year.) In addition, Lautenberg's bill reserves 50 percent of the Federal funds for poverty area school districts and places a great emphasis on local school districts demonstrating that they have adequately planned computer education programs before they can qualify for Federal aid.

The third bill, introduced by Representative Gore, is directed at the shortage of quality educational software. It seeks to establish a National Educational Software Corporation which would have the authority to provide venture capital support for educational software projects which lack adequate private funding.

Hearings held before the House Subcommittee on Science, Research and Technology in June on the bills introduced by Wirth and Gore resulted in insightful commentary and occasionally heated debate about the proper role of the Federal government in computer education. In particular, provisions for Federal funding of hardware acquisition by local school districts and for Federal involvement in software evaluation and/or development proved controversial.

Arguing that Federal support of local school district's efforts to acquire computers is necessary, Representative Wirth told the Subcommittee, "There are only 325,000 computers for America's 40 million public school students, roughly one computer for every 123 students. If every child in our schools was to be provided 30 minutes a day on computers, we would need four million (computers) in our schools, 12 times the actual number."

Harry A. McQuillen, president of CBS Educational and Professional Publishing, supported Wirth's view on this point, stating, "We estimate that by the end of 1984 nearly 400,000 microcomputers will be in our elementary and secondary schools. On the surface this seems like a large number and suggests dramatic progress. However, these micros are heavily concentrated in more affluent school districts and projections show that we will not achieve a ratio of 30 students per computer until 1987. Under these conditions it seems necessary for the Federal government to assist in building the base of microcomputers in schools."

F. James Rutherford, of the American Association for the Advancement of Science, also spoke in support of a Federal role in this area, but argued that it was essential "to ensure that thoughtful planning takes place at every level—Federal, State and local—before providing the schools with more computers." He stated that planning now "may be the only chance we have to focus our resources and attention on efforts to realize the most powerful and unique features of the computer as an educational tool" and warned that without effective local planning, "computers will surely experience the fate of other technologies of high promise—ending up unused in closets or used by only a few teachers, and even then in mostly routine ways."

Several speakers also addressed an alternative to the Federal government providing direct funding for hardware acquisition, in the form of a change in the tax code that would give special incentives to computer manufacturers who donate hardware to schools. Apple Computer, which has donated approximately 10,000 computers to schools in California under the auspices of a tax-incentive program, has offered to provide a computer to every elementary and secondary school in the country in return for more favorable tax treatment of such donations.

The chief argument against this alternative to direct Federal aid for computer hardware purchases is that computer manufacturers might be inclined to make most of their donations in school districts in which the parents of the children attending school would be financially capable of buying them a computer for home use. As Representative Wirth told the Subcommittee, "The tax code approach provides no assurances schools in poorer districts would have the same access to such equipment as would schools in wealthier districts." In addition, he said, "There is no guarantee that schools would obtain equipment best suited to their educational needs." Wirth also noted that the tax code approach does not address the issues of teacher training and the lack of quality educational software.

Although strongly supportive of the approach taken in Wirth's bill, Linda Tarr-Whelan, director of government relations for the National Education Association, told the Subcommittee that the NEA "can see circumstances under which such donation legislation could be helpful in a limited way," but stated that to obtain NEA support, such legislation would have to meet several criteria, among them "proper assurances of geographic and economic di-

versity in the donation patterns of these computers" and assurances that the donor would also supply teacher training and software at no cost to the school.

The role of the Federal government in software evaluation and/or development, a subject addressed in both bills being discussed in the Subcommittee, was more controversial. The argument in this area hinges on whether the software industry has been sufficiently responsive to the needs of schools for quality educational software. Gary L. Bauer, deputy undersecretary for planning, budget and evaluation of the U.S. Department of Education, said that software producers were doing their job, arguing that, "Computer literacy is being taught in all parts of the country. Teachers and educators in every state have access to fine materials. The private sector is providing a wide range of excellent programs." For that reason, he added, "The Administration does not support these two pieces of legislation. They are excessively costly and would mandate a level of Federal involvement and control which is inappropriate. We think there are Federal programs already in place . . . which are adequate to stimulate the development of high quality software in those areas which pose too great a risk for the private sector and to demonstrate the effective use of the technology."

Reacting to statements that "the government already has the tools to stimulate more software production," Representative Gore said, "If that is the case, I ask, 'Where is it?' It is certainly not in the Memphis, Tennessee, school system, where school administrators are scraping together a budget for computers, but complain that high-quality teaching software simply is not available. It is not to be found anywhere else in Tennessee either. And the whole country faces the same problem. . . . High-quality educational software is almost nonexistent in our primary and secondary schools."

A report issued by the House Committee on Education and Labor in May of this year upon their approval of Wirth's bill, adds support to Gore's response, stating, "Secretary of Education Bell testified that although there was an impressive amount of educational software currently available, most was inadequate for the task of educating our young people. . . . Much of the software now available, according to the Secretary, comprises 'low-level, drill and practice programs.'"

As might be expected, representatives of the publishing and software businesses are opposed to any Federal involvement in this area. A statement submitted to the Subcommittee by the American Association of Publishers argued that Federal evaluation of software would violate the well-established principle of decentralized education, and concluded, "We strongly urge that no provision for evaluation of software or other instructional materials be included in any bill."

"What we hope to accomplish is commmunication between the educational community and the business community."

CBS's McQuillen argued that no Federal evaluatory mechanism for software was needed because, "Over the last year the quality of educational software has improved dramatically. . . . Evaluation as a protective device for the consumer of software is becoming less necessary."

Sue Talley, education program development manager for Apple Computer, Inc., also reported a significant improvement in the quality of educational software over the last year, saying, "There are significant trends to show the use of computers is shifting to include not only improved drill and practice courseware but also simulations and productivity tools."

In addition, Talley warned the Subcommittee against any legislation that would establish criteria for the hardware or software used in schools. "Our technological expectations can be changed overnight by the ever-expanding potential offered by new hardware," she said, adding, "To establish rigid criteria in an era of dynamic technological change in the hardware which is economically viable for education would be a mistake."

Representative Wirth countered such arguments by saying that, "Our intention was not to have the Federal government write educational software, which would be similar to the Federal government writing textbooks. This would not only overstep the Federal government's lines of responsibility for education, but it would also be bad educational policy. Instead, what we hope to accomplish is a fostering of communication and sharing of information between the educational community and the business community." He stated that the Federal mechanism proposed in his bill would "focus on such questions as how best to use the new technology and what software qualities make for an effective learning experience, but not such activities as listing the manufacturers considered to make quality software or producing a list of criteria software manufacturers must meet."

It appears unlikely that any of these bills will be enacted this year. The bills introduced by Wirth and Gore were approved by the Subcommittee on Science, Research and Technology in June, and are scheduled for action by the Commmittee on Science and Technology in August, but because the legislative session is short this year, it remains doubtful whether either will be subjected to a vote on the floor of the House. Chances for a vote this year on Lautenberg's bill in the Senate are also slim. Nevertheless, one Congressional observer suggests that the time spent on these bills has not been wasted, telling us, "Any kind of legislative movement like that of introducing bills, holding hearings, having votes, is a way Congress educates itself. I think that this year has been a year of that. I would suspect that next year there's going to be a lot of action." What form that action will take is unclear—and is likely to be affected by the upcoming elections. At this point, the only thing that is clear is that Washington is becoming aware that computer education needs help if it is to flourish in this country.

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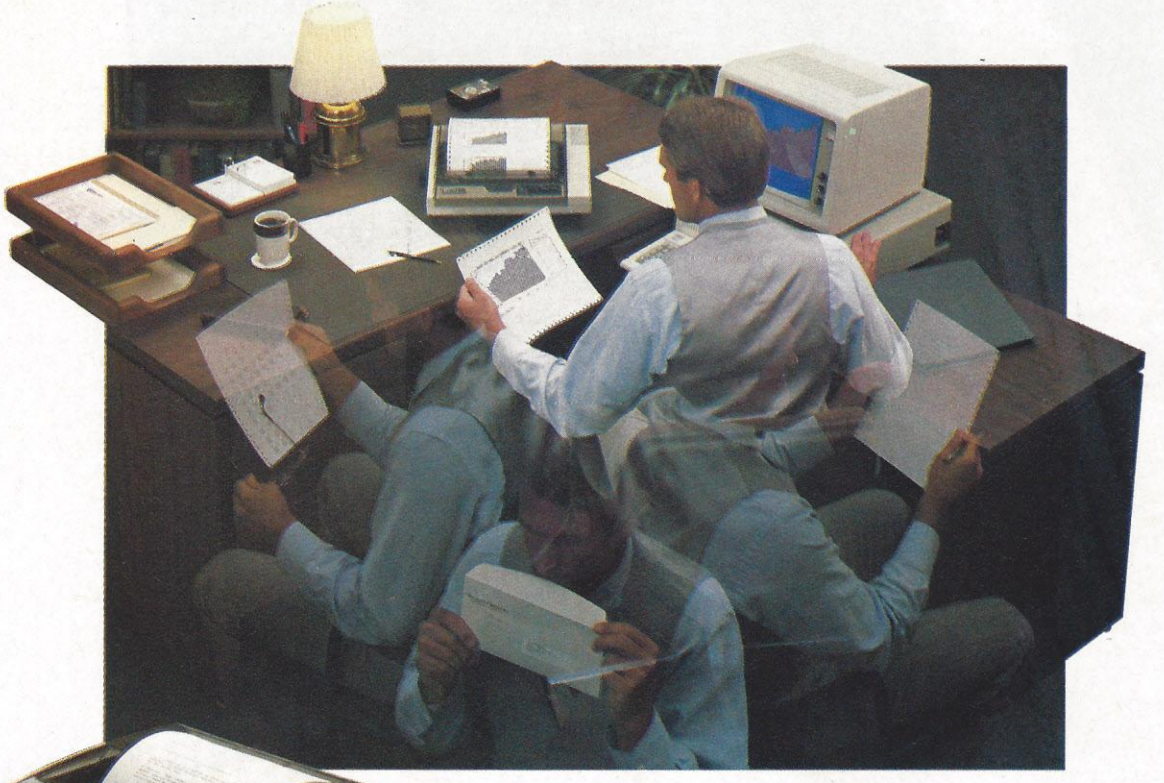

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CIRCLE 4

"The 12,000 wealthiest schools are four times more likely to have microcomputers than the 12,000 poorest."

enough talented people (to act as trainers) but a lot of the schools just don't have enough equipment."

Equal access for all

In her testimony before the House Subcommittee on Science, Research and Technology, the NEA's Tarr-Whelan stated, "There is a persistent and substantial inequality in the access to new technologies among both schools and school children. In simple terms, the poorer a school is, the less likely that school is to have any of this new technology." The Johns Hopkins survey supports that statement, noting, "Public schools in districts with a high percentage of poor families are much less likely to be microcomputer-owning schools. For example, whereas two-thirds of public schools in the better-off districts have microcomputers, only 41 percent of schools in the least wealthy districts have any."

Brumbaugh expresses doubt as to the seriousness of the equity question. "I don't necessarily agree that wealthier school districts have more (computers)," he says. "If you look at Detroit, all the computers are in the poorer schools. If you look at Minneapolis, the computers first went into the schools where the lower economic groups were. If you look at New York City, look at Los Angeles, at Dallas, at Houston, that's the case. It's not a socio-economic thing, it's just a teacher awareness, teacher leadership kind of thing. And perhaps lower socio-economic school districts have a weaker set of teachers, in which case there's less likely to have been a natural set of leaders who went out and made computing happen."

Nevertheless, according to Sen. Robert F. Byrd (D-W.Va.), a co-sponsor of Sen. Lautenberg's bill, who cited a 1983 study produced by the University of Minnesota, "The 12,000 wealthiest schools in this country are four times more likely to have microcomputers than the 12,000 poorest."

"Children in economically deprived areas frequently utilize computers, when available, only in a drill and practice mode—something akin to electronic flash cards—while those students in more affluent communities tend to be exposed to computers in a wider diversity of approaches—programming, simulation, development of higher level skills," notes NEA's Tarr-Whelan.

Brumbaugh argues that the drill and practice "is probably what the teachers are used to doing in those places. The flashcard and basic skills stuff was happening in those schools before computers arrived, the computer didn't bring the problem. That's what those people are used to doing there. There's a need for it. Now, what you're implying is that it's still creating a problem for society. Yes, it is. But the problem is not what's happening in the schools, it's what happening in those communities. The acquisition of computers in the home is more likely to occur in the higher socio-economic groupings."

"I think the equity problem is probably going to solve itself just as television equity solved itself over a period of years," says White of Columbia University. "In time, everybody seemed to be able to find the funds for a television set. I think that will be true of the computer, too. There's a period of time when there is inequity, of course, but I think it's self-closing over time."

Other educators are less optimistic. Ioni is skeptical of such sentiments when it comes to New York City's public schools. He says the equity problem is as simple as, "the rich school districts have computers and the poor school districts don't. I don't know if it will go away in time. I think we've got to give it some help."

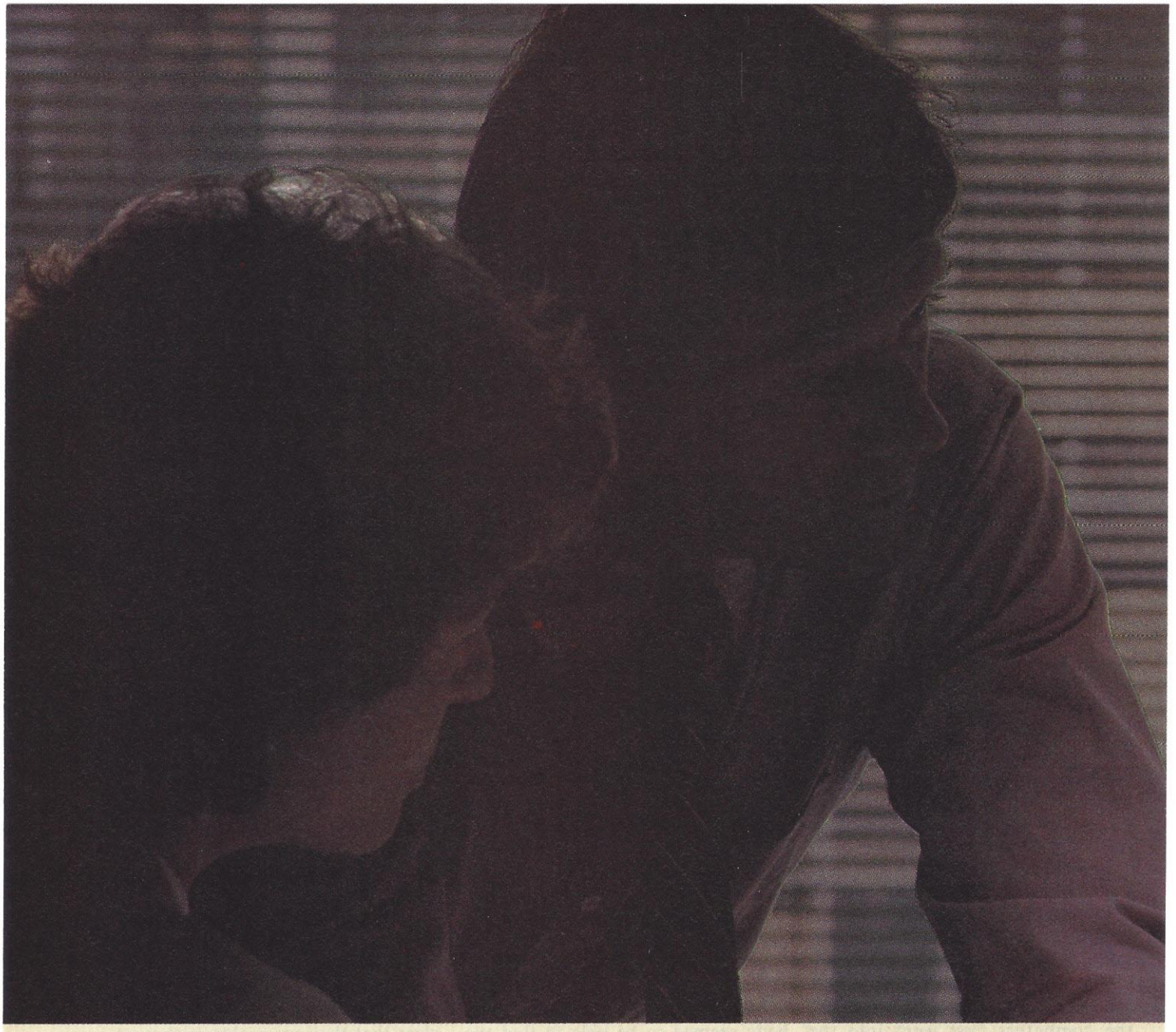
Failure to close the equity gap, according to Sen. Christopher J. Dodd (D-Conn.), another co-sponsor of Sen. Lautenberg's bill, "may ultimately create a technological caste system within the nation's schools that we can ill afford." Tarr-Whelan supports that view, saying, "The question of equity of access to school computers is a microcosm of a much larger issue: The necessity to provide access and equity to quality educational experiences for all of our nation's children. We simply cannot allow technology to exacerbate this problem."

A time of change

It is clear that, despite widespread belief that computers belong in our schools, getting them in and putting them to use is not a smooth process. Perhaps it shouldn't be. "School administrators should read about the papacy in the 16th century," White says. "I think that all this technology is to the schools what the printing press was to the Pope. It's going to make people question all kinds of things. I think it's good for us, it shakes us up a bit."

The problems faced by schools as they attempt to develop effective computer education programs—inadequate software, a lack of teacher training, insufficient hardware, equity issues and the inevitable changes to come in the structure of education—are significant and cannot be solved overnight. However, it is increasingly clear that they are problems that we must face—and conquer. As Sen. Lautenberg said upon the introduction of the Computer Education Assistance Act of 1984, "Our competitive position in the international economy is dependent on the ability of this country to produce well-educated, skilled and creative workers."

Computer education programs can significantly improve our ability to do so by providing powerful tools to improve the quality of education in all subjects and by introducing children to the technology of the future. For children entering school today—who will go to work for the first time in the 21st century—and for a nation depending on those children to be the workforce of the future, computer education cannot be thought of as an optional course or a luxury, it is nothing less than a necessity.



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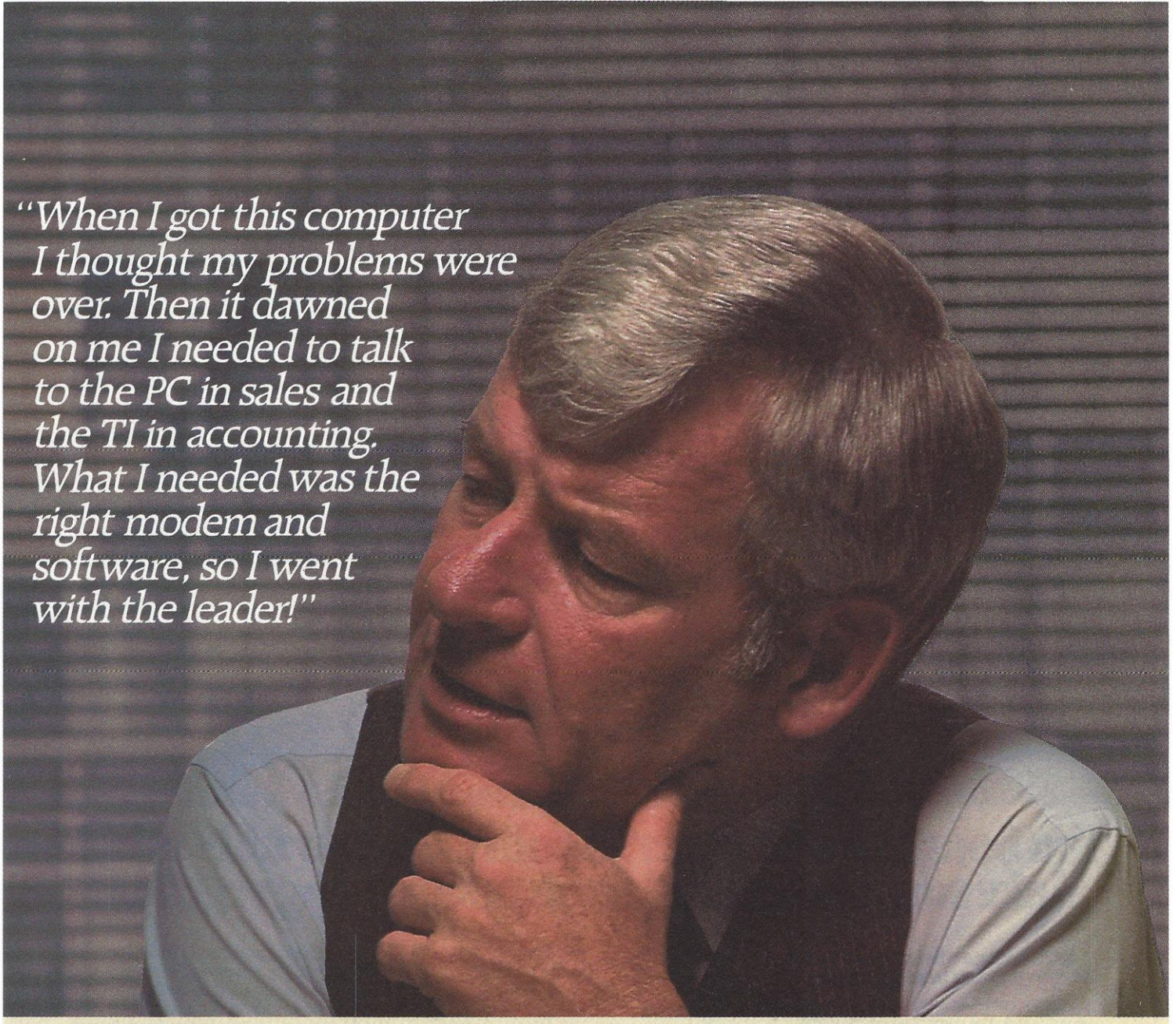

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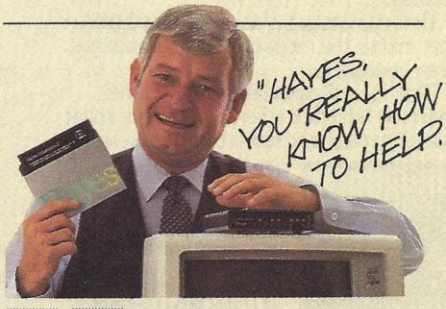

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Education's New Challenge

The most important task for teachers in the Information Age is to build a partnership between traditional and nontraditional education, letting each do what it can do best

by Ernest L. Boyer

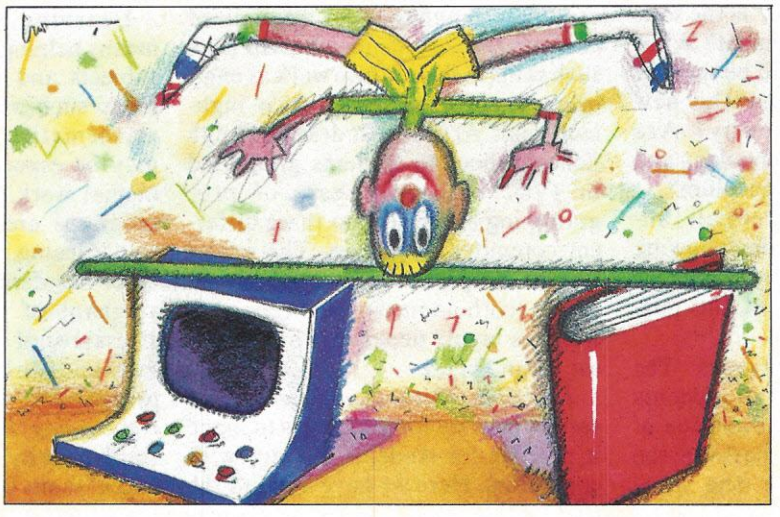

Illustration by Juan Cruspimera

We are living in a new Information Age. Digital watches, hand-held calculators, telephones, and miniature televisions all depend upon the power of the silicon chip—a minute integrated circuit etched onto a fleck of silicon that controls the flow of "bits" of information.

Glossy full-page ads describe computers as the new electronic teachers, and Congress has debated the value of giving an Apple to every teacher. The Micro Millenium, as it has been called, touches every sector of our lives.

Educators with long memories will say, "Here we go again." They recall that virtually every new piece of hardware introduced into the schools in the past three decades has been oversold, misused, and eventually discarded. "Technology breakthroughs" still fill school storerooms. They gather dust, unused after 20 years or more.

Looking back, technology revolutions have come and gone because the hardware has been better than the content. Consider instructional television. Programs of 20 years ago were little more than "talking heads" that offered the worst features of classroom teaching and none of the excitement of the new medium. Little wonder teachers, students, and finally, the tube, were turned off. "Sesame Street," which so captured the eyes and ears of preschoolers, was one of the few exciting experiments that endured because the presentation was imaginative and because the content was substantial.

Bonnie Brownstein, of the New York Academy of Sciences, criticizes much of the existing software for its failure to encourage original thinking. "You just buy a package," she says. "It's so controlled and organized that you don't have to use your own mind."

Karen Sheingold of the Bank Street College of Education adds the criticism that computer-based instruction is often not related to the curriculum in the schools, a point of view supported by a U.S. Department of Education study: "Teachers want materials that will give students expanded practice for skill mastery and they want software that can give them more time to meet their students' instructional needs—literally to 'free-up' time for teaching. But one only has to look at a sampling of these activities to raise questions about the content, the pedagogical approach, the formats, and even the errors in some of the programs that are being used. . . . We have a lot to learn."

These warnings are not from people opposed to computers in the schools. On the contrary, they come from those who share the belief that, properly used, this new technology can help, even revolutionize, education. The point is, however, that all too much of today's computer instructional material resembles a book with blank pages. The technology is available—and increasingly affordable—but educational content that makes the investment worthwhile for

schools is largely lacking.

Technology revolutions have failed to touch the schools also because purchases frequently have preceded planning. School administrators are eager to be "with it." Having TV instruction, teaching machines or language laboratories in the schools has been viewed as a flashy status symbol.

Here is the essential point: The deliberate absence of a computer policy is itself a policy which contains major risks. No school should buy computers, or any other expensive piece of hardware, until key questions have been asked—and answered. Why is this purchase being made? Is the software as good as the equipment? What educational objectives will be served? Which students will use the new equipment, when and why? Are teachers able to fit the technology and the software into the curriculum?

In searching for appropriate answers to these questions, the following priorities should be set by schools as decisions are made about the purchase of computers:

Learning About Computers: The first priority is to teach all students about the technological revolution of which computers are a part. In the future, computers for the nonspecialist will be so convenient to use that little technical skill will be required. Few citizens of tomorrow will spend time at a computer keyboard or will write a computer program. Therefore, the first goal should not be hands-on experience for students. Rather, the urgent need is for students to learn about the social impact technology has made and will make on their lives.

All students should understand the extent to which the microchip controls transactions at work and increasingly at home, and they should discover the implications of a global communications network that makes it possible for messages to span the earth instantaneously. In short, the first obligation of the school is to put the technological revolution in perspective for its students. Buying computers before this core educational program is solidly in place is to turn school priorities upside down.

For a small number of students, learning about computers also means advanced computer study. This upper-level program would teach computer language and specialized usage to those students who will need such skills in their future work as engineers, scientists or specialists in high-tech fields. At the Oxford (Mass.), High School, about 40 students graduated in 1982 with two years of programming experience in three different computer languages. The school system prepared these students to gain a foothold in the local economy, which is highly dependent on the latest technologies.

Learning With Computers: The second priority for a school is to make it possible for students to learn with computers. Here we have in mind the use of computers to gather information, using terminals in the library or in classrooms for reference and bibliographic searches. Students at Lindbergh, Princeton, and Palisades Park High Schools in New Jersey are using personal computers connected by telephone lines to an electronic version of the *Academic American Encyclopedia*, which is exactly the same as the printed version consisting of 21 volumes and 9 million words. Such user-friendly equipment will soon make it possible for students with limited knowledge of the technical aspects of computer programming and equipment procedures to call up information from data bases.

Learning with computers also means helping students study specific subjects and improve their skills in areas such as writing, spelling and mathematics. Here, the computer may be especially important for remedial work. Today most computer programs are, in fact, designed for rote learning. They are what one educator has described as "the new drill sergeant of the classroom." They stress recall of previously learned facts and can be very helpful as a tutor to individual students.

Learning From Computers: The third priority is to help all students learn from computers. Computer learning at its best is interactive. The most powerful benefits of computers in learning are realized when students use technology to achieve high-order learning, when a student can, in a very real sense, "converse" with the computer and develop better thinking in the process. Ithiel de Sola Pool, writing in the Fall 1982 issue of *Daedalus* magazine, describes the possibilities of this new kind of schooling: "Before the computer, every communica-

Dr. Ernest L. Boyer is president of the Carnegie Foundation for the Advancement of Teaching (Princeton, New Jersey), an education policy study center established by Andrew Carnegie in 1905.

Before joining the Carnegie Foundation in January 1980, Dr. Boyer served as the United States Commissioner of Education, administering a $12 billion federal budget.

Dr. Boyer's teaching and administrative career has included positions as Chancellor of the State University of New York (SUNY), Academic Dean of Upland College (California), and Director for the Center for Coordinated Education at the University of California at Santa Barbara.

The recipient of honorary degrees from 57 United States colleges and universities, Dr. Boyer was selected by his peers as the nation's leading educator in a national survey in 1983.

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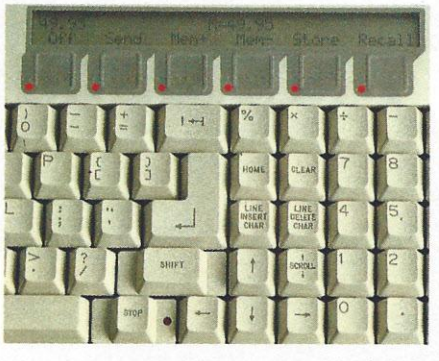

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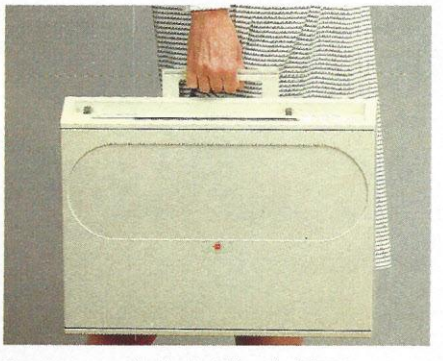

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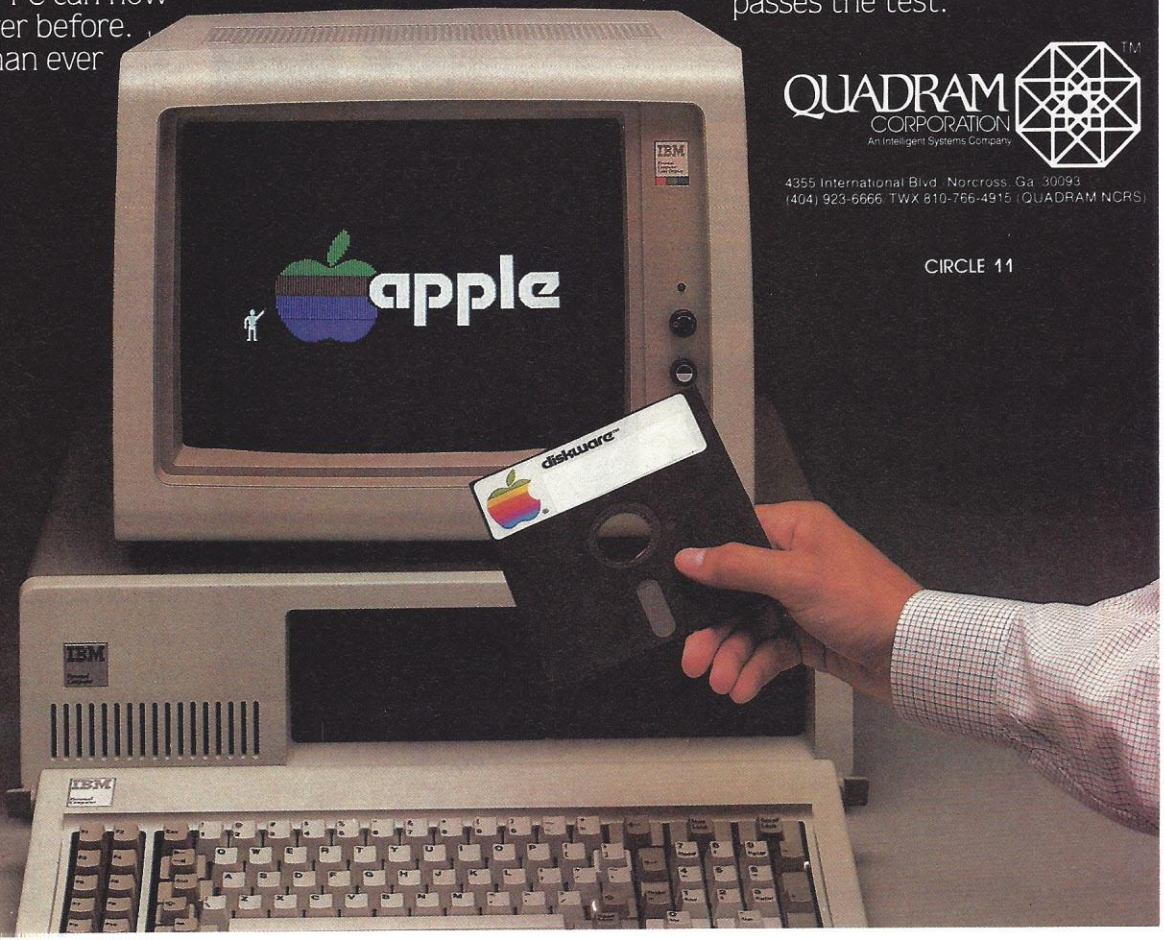

tions medium or device was essentially dumb. If it worked right it delivered at the far end exactly the message that a human being had put in at the start. There could be noise or attenuation, the paper could tear, but the medium added nothing positive. What a human being put in, a human being could take out, and that was all. Now for the first time, the message that goes in is not necessarily the message that comes out. For the first time, thanks to digital logic, messages may be modified or even created in the machine."

The day may come when schools will have available to every student multimedia consoles with enriching programs, when students will move easily from the teacher to a console and back again, when the curriculum and the computer content will have blended. Students at such a console could study the anatomy of the human body, conduct science experiments, design buildings, stress-test the Brooklyn Bridge, or view the world's greatest art gallery.

In the summer of 1938, the essayist and novelist E.B. White sat in a darkened room and watched transfixed as a big electronic box began projecting eerie, shimmering images into the world. It was his first introduction to something called television. White said:

"I believe television is going to be the test of the modern world, and that in this new opportunity to see beyond the range of our vision we shall discover either a new and unbearable disturbance of the general peace, or a saving radiance in the sky. We shall stand or fall by television—of that I am quite sure."

Whether the new electronic teachers, from TV to the computer, become a "saving radiance" in education or remain an "unbearable disturbance" will depend on whether we have learned the lesson of the past. It will also depend on whether programs are well prepared, whether teachers are made partners in the process, and, above all, whether schools have an education plan before they purchase equipment.

To improve computer material for education it seems appropriate to suggest that every computer firm selling hardware to the schools also establish a special instructional materials fund. Such a fund would be used in consultation with classroom teachers to develop high-quality, school-related programs. I also suggest that when schools consider the purchase of computer hardware they base their decision not only on the quality of the equipment but also on the quality of the instructional material available. In addition, districts should take into account the commitment of the firm to invest in the continued development of instructional material for schools.

Further, teachers need to know that programs are accurate and unbiased. They also need to be reassured that a software package has an educational value that cannot be gained in other ways. It is strange that while textbooks are endlessly scrutinized, it seems, computer software is virtually ignored. Some educational journals are beginning to publish software reviews as an aid to teachers, but the efforts needed are only beginning.

Therefore, I urge that a national commission, composed in part of outstanding classroom teachers, be named to evaluate the quality of computer software being prepared for classroom instruction. Recommendations from this commission regarding the value and use of such material should be made available to the schools. It would be appropriate for the Secretary of Education to appoint such a national commission.

The point is this: For technology to be used in schools, teachers must learn about the new equipment. They must discover how it works and become informed about its possibilities and its limits. For those teachers already in the classroom, computer companies should provide short-term summer seminars and perhaps scholarships to keep them up to date on the uses of technology as a teaching tool.

The challenge is not to view technology as the enemy; nor is it to convert the school into a video-game factory, competing with the local shopping center. Rather, the challenge is to build a partnership between traditional and nontraditional education, letting each do what it can do best.

Technology has the potential to free teachers from the rigidity of the syllabus and tap the imaginations of both teacher and student to an extent that has never been possible before.

In the long run, electronic teachers may provide exchanges of information, ideas, and experiences more effectively (certainly differently) than the traditional classroom or the teacher. The promise of the new technologies is to enrich the study of literature, science, mathematics, and the arts through words, pictures, and auditory messages. To achieve this goal, technology must be linked to educational objectives.

Technology must also be linked to human needs and goals: Television can take students to the moon and to the bottom of the sea. Calculators can solve problems faster than the human brain. And computers can instantly retrieve millions of information bits. Word processors can help students write and edit. And the classroom of the future can be a place where the New York Philharmonic comes live from Lincoln Center.

Above all, the classroom should be a place where students are helped to put their own lives in perspective, to sort out the bad from the good, the shoddy from that which is elegant. For this we need teachers, not computers.

Television, calculators, word processors, and computers cannot make value judgments. They cannot give students wisdom. That is the mission of the teacher, and the classroom must also be a place where the switches are turned off.

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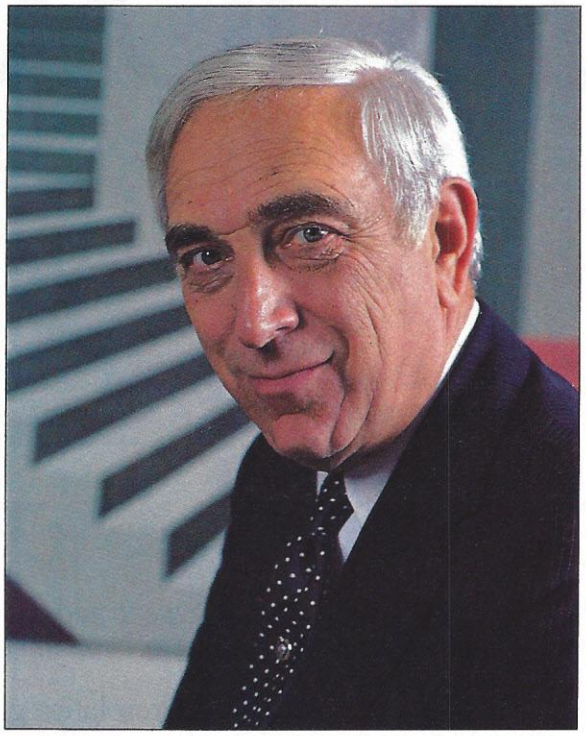
CIRCLE 77

Senator Lautenberg On Education And Government

Armed with a solid business background and a strong sense of social issues, Frank Lautenberg is carrying the crusade for better computer education into the Senate

One of the most active advocates for the establishment of effective computer education programs in this country is New Jersey Senator Frank Lautenberg, whose Computer Education Assistance Act calls for increased federal government assistance for computer purchase and teacher training in local school districts.

Lautenberg, who is cofounder and former CEO of Automatic Data Processing, (ADP), Inc., is keenly aware of the need to improve the educational system, and sees computers as a valuable tool in the process. "We must provide adequate resources to support top-notch education for our children or be prepared to face the consequences," Lautenberg told the Senate when he introduced his bill on April 4, 1984.



Photograph by John Bowden

Senator Lautenberg outlined his views on computers in education in a recent interview with Personal Computing's *Paul Bonner.*

You addressed the issue of computer literacy in schools in your first speech to the Senate. How did this become such a major concern of yours?

Lautenberg: Well, I came out of the computer industry. My background in that field goes back to the advent of the first commercially viable computer in 1961, the IBM 1401 series. It's obvious that we are entering what may be—if not the final stage—the later stage of a switch from the way we used to make our living to the Information Age. And I felt as I visited the various parts of the state that unless we seize the opportunity before us a couple of things are going to happen. Number one is that we won't be doing the preparation necessary to provide the workforce, the management, the technicians, to do the jobs to maintain our computer technology preeminence, that we would not be able to compete with other countries. I was concerned with the continuous decline in SAT scores and general literacy.

The second thing that really concerned me was the social equation. The school districts that have the means to provide a very good education normally can accelerate that process substantially because a lot of these youngsters come from better financed school districts that have advanced tools to work with. Whereas those in the poor urban centers fall further behind. The richer kids—I use the term loosely—the richer kids have computers at home, computers at a friend's house, lots of access. Kids in the poor areas wind up with maybe a chance at the electronic games and never really get the opportunity to get trained to deal with the computer as part of their education or as a part of their opportunity to make a living later on. So I think it's an essential for our country to maintain an early start on getting a child famil-

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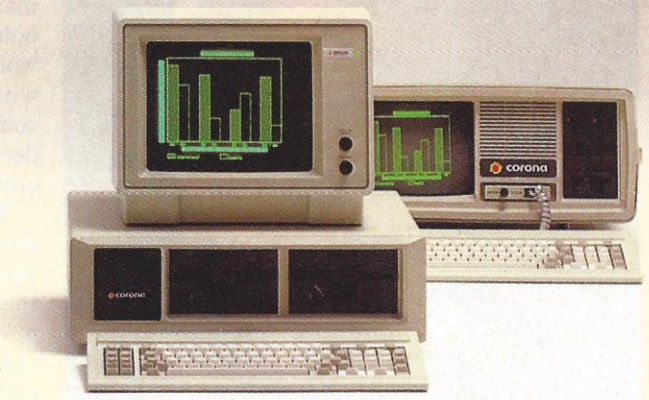

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CIRCLE 78

iar with the technology and the opportunity for teaching, using the computer more as a pencil than a book, a tool for learning, and not continuing to separate what I see coming as a real division in social classes in this country, exaggerated by the pace of learning and the opportunity for computer use.

It's often put this way—isn't it?—that in more well-to-do school districts many of the students are really getting to explore the computer whereas in poorer school districts they're often used almost exclusively for remedial work.

Lautenberg: Remedial or games. I think that's probably true. What we want to do is to change that. That's why this bill calls for the creation of a teacher training institute under the National Science Foundation. The object is make certain we have teachers who understand what they've got. What we want to do is refine the planning at all levels of schools. Where the poor school districts don't have the ability to train the trainers, teach the educators, we want to try to deal with that. We demand that they have a plan that includes specs for teachers, specs for curricula—it's all part of the process.

There seems to be concern on the part of some parents that basic elements of education are getting lost in the schools. What happens when you put a computer in the classroom?

Lautenberg: I think it enhances the opportunity to learn. I recently went to a school district in Pennsauken, in the southern part of New Jersey. They have a pretty advanced educational system. I walked into a computer room; they had Apples and a couple of other things—terminals. One youngster was sitting there. I asked him what he was doing. He said he was learning math. He didn't say he was learning programming. A girl next to him, about nine years old, said she was doing English, and vocabulary words, and sentence construction. I think it's excellent for basic learning.

In your experience, is that fairly typical? Are the computers now in place in the classroom being used well?

Lautenberg: No, it's not typical. It's an example of the more unusual. The problem is—and that's what our bill tries to address—people don't even in many cases know how to plan to use the equipment. We're demanding that if the school district wants to apply for a grant—shared one-quarter local, three-quarters federal—that they do some planning. They should submit a plan on how they intend to use it, how they intend to train the trainers, the educators.

> *"It's essential for our country to maintain an early start . . . using the computer more as a pencil than a book."*

Our mission in the bill is to get a model going for the whole country. We're looking at something costing around $150 million a year for four years with an automatic three-year extension. That's barely the cost of a B1 bomber. We think however that it's enough to ensure that a microcomputer exists in every school district in America—half of it going to Title One schools in the poorer districts and the other half being distributed on a some kind of a priority basis, the priority being established by the states. By the way, this includes parochial and private schools as well. We think that if we are going to do an experiment on education in America it ought to cross all lines. So that, we hope, with a year or two or three's experience, will tell us exactly what we have to do to improve the system. We think it's kind of an experiment or a research investment, well worth making. We hope that we will be able, out of that, to determine those systems or those programs that work best to ensure the most efficient way to deal with this.

We hear a lot from teachers that they don't know where to find good software for the classroom.

Lautenberg: Well, part of what we want them to do is be able to understand what to look for in a software package. What kind of a computer they ought to be looking at. What they want to use it for. These are some of the questions we hope will be addressed in the legislation we're proposing. It's a model that we'll be able to work with and get some practical experience and that when we've spent that kind of money and we've put it in enough different places that we'll have a chance to see it in real life as opposed to trying to create a model that works in every place.

What do you see as the National Science Foundation's role in this?

Lautenberg: Well, in helping create the course structure. Helping tell us what kind of facilities are needed. Maybe helping to recruit some of the consulting staff that we need. Providing general supervision and direction.

Are they working in that area at all now?

Lautenberg: Not specifically in this, but they're doing so much work in computer technology that I think this should be a fairly simple task for them. We know that they're honest and objective. They're not going to be playing politics in this thing.

What are the chances of passage of the bill as it now stands?

Lautenberg: It would be a kind of a shot in the dark for me (to make a prediction). I can tell you that I have talked to a lot of people. I've got some very good co-sponsors: Chris Dodd, who had a bill (in this area) on his own; Senator Kennedy, Senator Moynihan; Senator Byrd.

There's also a bill in the House that calls for substantially greater funding of computer education programs

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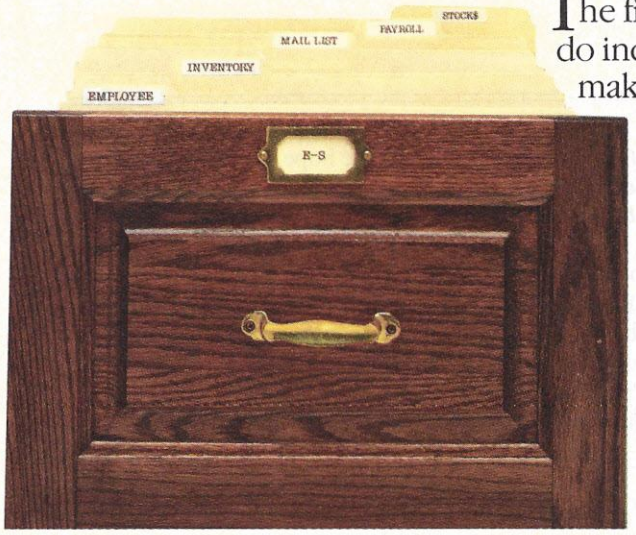

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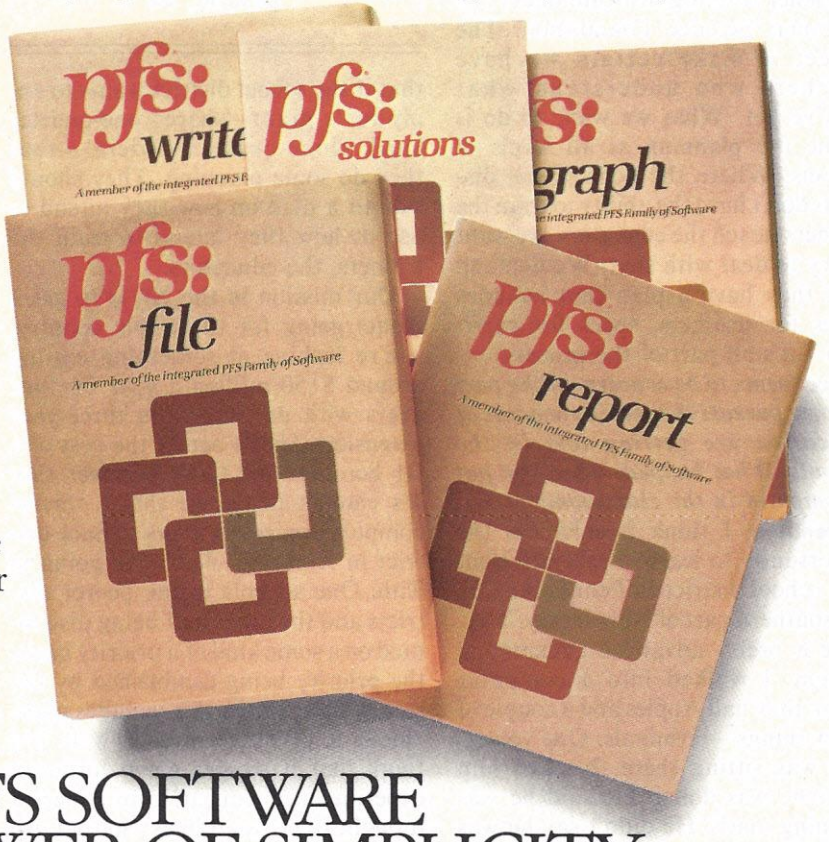

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than your bill. *Editor's note: The bill referred to here—The Computer Literacy Act of 1984, introduced by Representative Timothy E. Wirth—originally called for 10 years of Federal funding of computer hardware acquisition by local school districts at a level of $300 million per year. Since this interview was conducted, Rep. Wirth's bill has been updated to call for a three-year program providing "such funds as may be necessary" to local school districts for the purchase of computer hardware.)*

Lautenberg: There is a bill in the House. We hope that we will be able to incorporate some of the features of that bill, where we think it applies. But we think our bill has a special character that distinguishes it a little bit. We think that it covers the area necessary in a reasonable fashion. We're not asking for sums of money that couldn't honestly be considered possible.

I think there is a conception among the general public that computer literacy is somehow equated with knowing how to program.

Lautenberg: The one thing you must be very careful about is not to set up computer education so that everybody thinks they've got to be a computer analyst or a programmer or a computer operator. It has to be used as a learning tool.

It's a frightening spectre for a lot of people—older people who had done mechanical jobs, the factory workers and the heavy industry plants: automobile, steel, machinery, equipment—as those jobs terminate and evaporate, which is what is taking place. What do you do if you're 45 years old, worked 25 years on the job? Forty-five years of age today is barely past mid-life. That's not the time for someone to retire, not someone who is mentally and physically able. These people are not college graduates for the most part, perhaps hardly ever college graduates. How do they view the terminals, the technological information age? They get frightened off.

As it is, I am concerned about the industrial unemployment that may come anyway. I'm part of an industrial task force in the Democratic Party to try and think through ways that people can earn their living without everybody being a croupier in a casino or working in a fast food place. We can't have a total service economy. It is believed that we will continue to shift jobs as we have in the past from pure manual labor to more thoughtful work, taking the rote stuff and doing it more and more mechanically with machines and perhaps having people do the work that creates the equipment that does the routine stuff. That switch in the character of the work force and the character of the job market is going to be an area of great concern for us, I think.

How can we help people become more comfortable with the new technology?

Lautenberg: We have to dissuade them of the notion that computers are reserved for the pilots, the engineers, the technicians. The retail clerk at the checkout counter is using computer technology. True, you don't have to know a lot about what goes on in the works, but it is part of the whole familiarization process. They use advanced technology in transportation. They manage trains, direct freight, direct traffic. We have a responsibility to say, "Look, children can do it. Adults can do it. You can learn these things." It becomes part of your normal life.

We find that in some school areas where adults have an opportunity to use the equipment in the school after hours, that some people take advantage of it. Some are very crowded. People have an interest in it. *(Editor's note—after-school access to computer equipment for adults is one of the provisions of Lautenberg's bill.)*

I see the ultimate computer world: People ordering merchandise from home, doing research at home, being entertained at home, doing business from home. People have to understand that the computer as we know it, and their life with a computer, will not be unlike any other advanced tools in modern society. But they have to take that first step.

What do you see as the main benefits of the computer as an educational tool?

Lautenberg: What it can do is identify those students who have the ability to move faster. Sort out the students who have unusual ability, permit them to pace themselves according to their ability as opposed to having to pace themselves to the slowest members of the class. I think that's a real benefit. I think self-instruction becomes a true reality for the curious child, the more gifted. It encourages independent thought. I see an opportunity to learn a whole new set of skills and to improve the pace of learning the basics.

I think it is a national responsibility. I believe that it will challenge the thinking of the youngsters growing up. I think that in the period in which we live and the one ahead of us . . . we have to provide the inquisitive mechanism and plant that curiosity in the youngsters. And you can do that if you search out those who have better than standard class ability. You don't know how many there are because the class usually moves at the pace of the slowest or slower and you lose an opportunity for discovery. Discovery of the quick mind, the facile thinker. That can be done at very early ages.

How do we compare with the rest of the world in the area of computer education?

Lautenberg: I think we compare modestly with the more advanced countries such as Japan, where students have earlier and more thorough training. They score better on engineering aptitude tests. They graduate many more engineers than we do. We graduate a lot more lawyers. Which says something about how our society is going—litigation as opposed to creation. Their students are better equipped to take the jobs that I talked about. We are falling behind fairly rapidly and this is one way to make it up.

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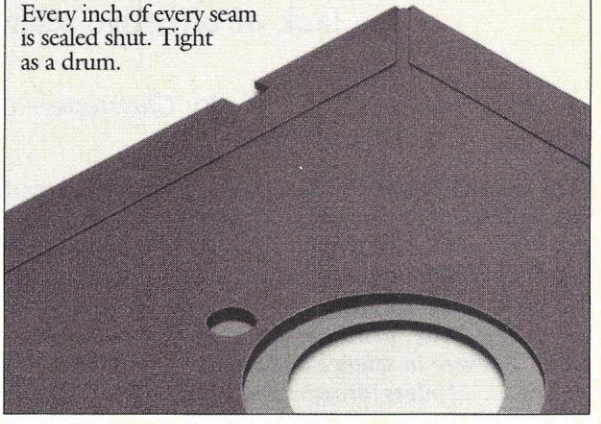

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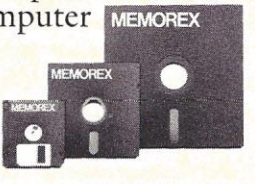

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CIRCLE 13

A Buyer's Guide To Educational Science Software

Can science software packages help make up for the lack of effective science education in our schools?

By Christopher O'Malley, Associate Editor

"The United States faces a crisis of major proportions in pre-college education. While a serious situation exists in several areas of basic education such as English and foreign languages, the problems are especially severe in science and mathematics. . . . Unless drastic and radical reform occurs, the deterioration of science and math education will accelerate and the consequences for the country's security, economy and viability as a democratic nation will be disastrous."

National Science Teachers Association
Journal of College Science Teaching
September, 1984

The call for better science education, authored above by Bill Aldridge, the executive director of the NSTA, and Karen Johnston, a professor of physics at North Carolina State University, is becoming more urgent every day. Young people, claim leading authorities in science education, are simply not receiving the kind of instruction in subjects like biology, chemistry and physics necessary to prepare them to live in a technology-oriented world. The state of science education in this country is—in Aldridge's words—"a mess."

"Science education today is somewhere between catastrophe and disaster," notes Aldridge, who heads the 42,000-member Association of Science Educators. "It's more of a mess than 10 years ago because you weren't claiming then that you were going to teach science to all of the kids; you were trying to prepare scientists and engineers. But now you are talking about teaching science to everybody . . . the reason being that we don't like to have a bunch of technological illiterates running around yelling about and voting on things they don't understand."

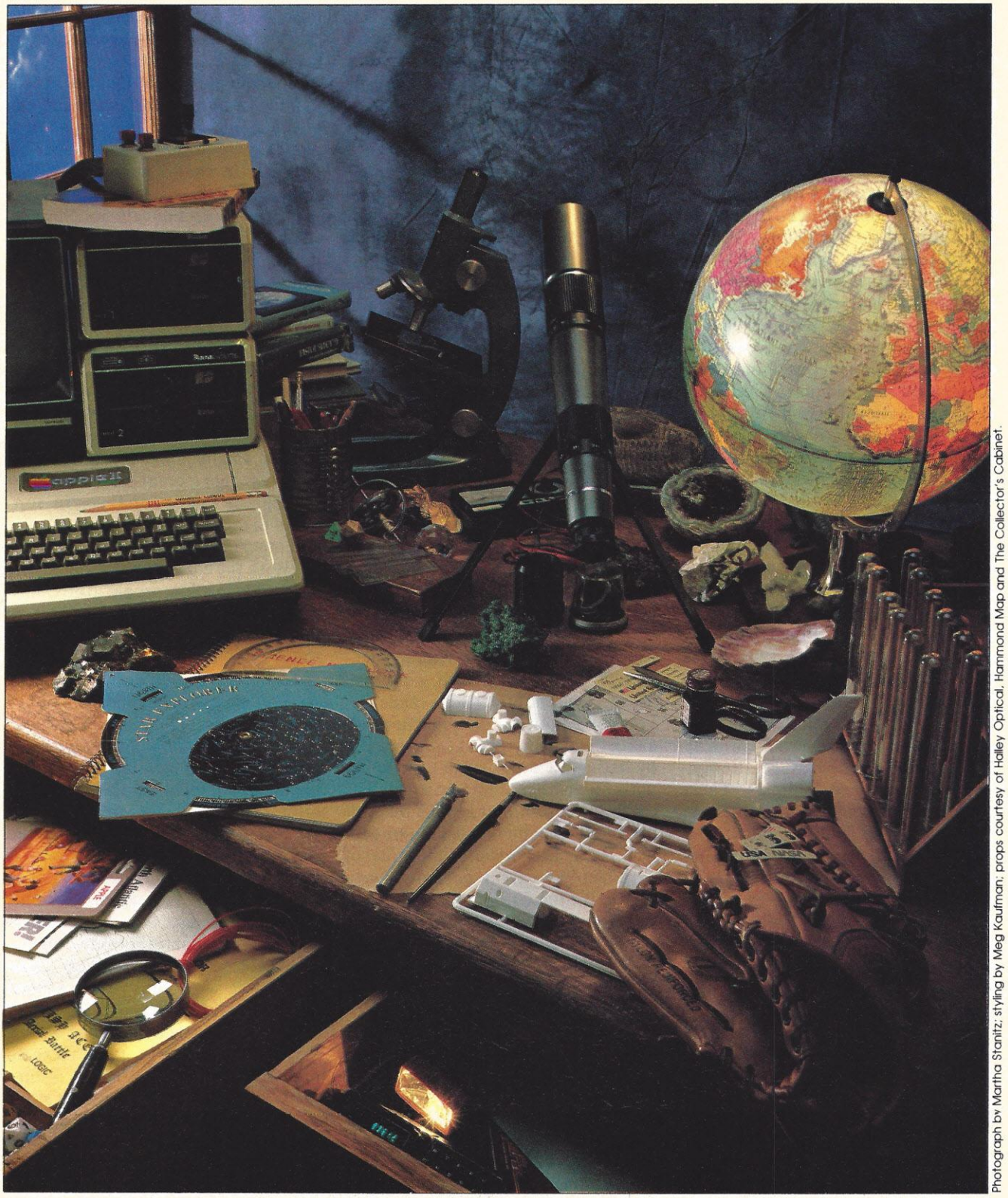
Ironically, the push to make people more technologically literate is likely to involve more use of modern technology, largely in the form of personal computers. Personal computers, running science-related educational software, are already helping some youngsters learn the ABC's of science both in schools and at home. But, thus far, the penetration of the personal computer into the area of science education has been a slow and limited migration from the more commonplace mathematics and language arts applications.

The diminutive role of the personal computer in science education seems to stem less from any of the *hardware's* limitations and more from a limited supply of effective science-teaching *software*. The reason? Economic realities stack the odds against producing good science software, according to Ken Brumbaugh, executive director of the Minnesota Educational Computing Consortium, producers of a variety of science packages.

"All of the emphasis on software development by the major publishers is on producing quick, easy, drill-and-practice applications in the math and language arts because that is where the money is," says Brumbaugh.

Producing educationally sound science software is neither quick nor easy since even the basic concepts of subjects like chemistry and physics present a more difficult challenge to a software developer (and to a student) than do topics such as addition or vocabulary words. For the same reason, science instruction—in any form—typically is not found outside schools, and not until the sixth grade, or so, is it even in the classroom. That age group has proven less appealing to software publishers than the home/school educational market for younger children. The result has been a relatively paltry amount of science software for use in schools and even less for use at home.

There are software packages which can help *prepare* a younger child to tackle the more complex concepts of subjects like physics, chemistry and biology. In addition to those programs which teach essential math skills for science instruction, there are an increasing number of software packages designed to develop basic logic/reasoning skills in children. Rocky's Boots and Gertrude's Puzzles, logic-



Photograph by Martha Stanitz; styling by Meg Kaufman; props courtesy of Halley Optical, Hammond Map and The Collector's Cabinet.

building programs published by The Learning Company, are almost universally considered to be shining examples of such programs. This type of software does not, however, attempt to instruct on a particular subject area like one of the sciences (although there are a few programs, like The Incredible Laboratory from Sunburst Communications, which attempt to teach "scientific method").

Marketing and software development issues aside, an important question looms: Can science software be an effective aid to a discovery-based learning experience like biology or chemistry? It is a question which Lawrence J. Fedewa, executive director of the National Education Association's (NEA) Educational Computer Service, must address in the course of evaluating educational software for "NEA Teacher Certified" approval.

"Part of the problem with science is that you are talking about subjects that really ought to be seen, if not smelled and touched," says Fedewa. "That's why the lab sciences are lab sciences—they take an empirical approach to things. And that can cause a lot of trouble when you are confined to a computer."

This kind of "trouble" has been most frequently recognized in drill-and-practice type software attempting to cover science topics. These packages are generally the target of harsh criticism from education professionals, who regard such programs as little more than "electronic textbooks." Dr. Leopold Klopfer, a University of Pittsburgh professor who chairs the NSTA's task force on science software, is an outspoken critic of science drill packages but finds some reason for optimism.

"Most of it is awful," Klopfer declares flatly of available science software. "A good deal of what is out there is drilling practice material and very little of it is instructional in any sense. It is not completely bleak, though. There are some constructive things that can be done in time with computer software in science. One such area is simulations, carrying out experiments, in simulated fashion, which are not easy to replicate in typical school settings.

Indeed, simulation programs seem to offer some hope, particularly as a way of bridging the gap between the science lab at school and the personal computer at home. Science simulation programs, which work in much the same fashion as Flight Simulator emulates the experience of guiding an aircraft through the skies, frequently offer an *entertainment* value as well as an *educational* value—a key to any educational software aimed at a home market. And simulation programs become especially valuable when the simulated experience, for reasons of time, expense or safety, cannot be performed at home or in the classroom.

Genetics simulations, for example, allow students to "witness" the breeding process and its effects without the considerable investment of time, money and care necessarily involved in performing the experiment themselves (or with others in a classroom). Catlab, one of the many science packages produced by University of Iowa-based Conduit, effectively condenses years of genetic experimentation into a short sitting in front of the computer by letting the user form a genetic hypothesis and test it immediately. The color of the resultant kittens that appear on the screen will tell the student whether he has predicted the effect of variables like parentage and sex correctly. Birdbreed and Heredity Dog, from HRM Software, offer the same kind of genetics simulation.

Other simulations are less textbook-oriented but more dramatic. Three Mile Island, from Muse Software, simulates the various activities within a nuclear power plant—including meltdown. Project: Space Station, the first in a new series of science programs from Human Engineered Software, simulates the construction and operation of a space station and purports to be based on authentic NASA design plans with NASA aeronautic engineers acting as consultants.

Educational simulations are in fact gaining in number, diversity and entertainment appeal. Imagic, a company known primarily for its market presence in the video and personal computer game business, now has two packages in its Educational Simulations series: Microsurgeon and Injured Engine, repair the broken parts simulations for the human body and automobile engine, respectively. Each package has noticeably game-like elements. Navigating a robot probe through the bloodstream of a human body in Microsurgeon, you must outmaneuver white blood cells which seek to destroy you as foreign matter. Injured Engine confronts you with a cutaway representation of a functioning car engine and you're supposed to race against the clock to tune and otherwise fix the motor.

"With the educational simulations, we're able to allow people to do things that are either too expensive, dangerous, inconvenient or embarrassing in the privacy of their own homes with the simplicity, speed and graphics capability of personal computers," says Bruce Davis, Imagic's president.

While simulations are making important inroads into the market for home science software, they still don't offer "hands-on" learning—a must for any comprehensive study of the sciences according to educators. A new program from Scholastic called Operation Frog, for example, simulating the standard frog dissection incorporated into most introductory biology courses, offers a quick, clean way to see what's inside the animal but obviously cannot provide the smell and feel of dissecting a frog in the biology lab. The important thing to remember about simulations is that they are an additional—and not a primary—source of educational material for science education, according to Robert Tinker, director of Technical Education Research Centers

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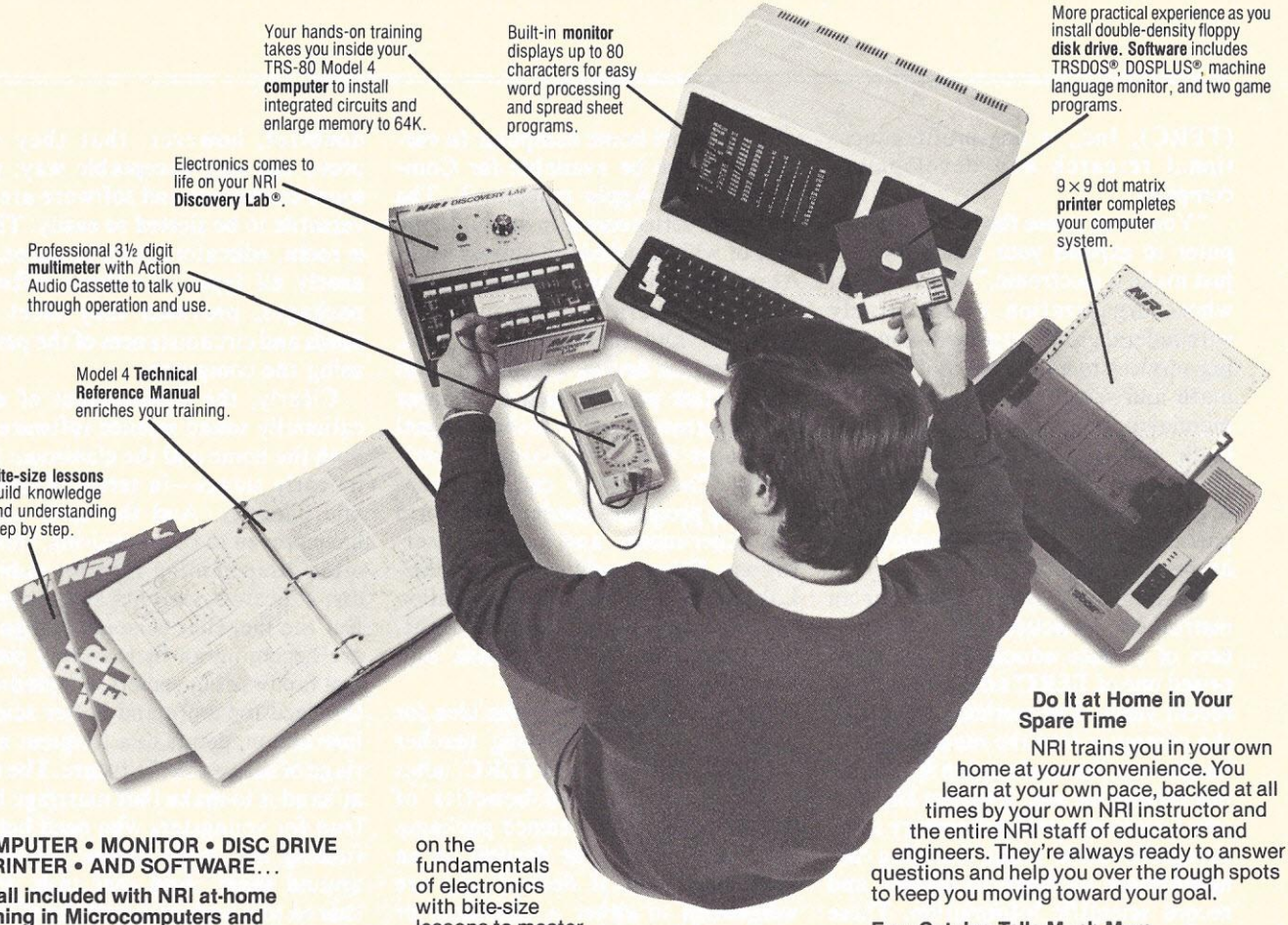

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"You want to use the personal computer to expand your repertory, not just make it electronic," notes Tinker, whose organization works largely with federal grants to provide consulting services to educators and develop math and science software for commercial marketers. "One shouldn't sit back and expect to have science poured into you. But you can make it a very active process. One way in particular is to . . . make the computer an instrument."

Making the personal computer an instrument, an active part of the process of science education, has comprised one of TERC's major efforts in recent years. The method of merging the computer into the mainstream of hands-on science education is a simple but innovative one: Connect the personal computer with laboratory measurement tools while running the appropriate software to display and record scientific information. These connections, most commonly made through the computer's game paddle (joystick) ports or through specialized add-on circuit boards, enable the personal computer to act as a *partner* in the process of science instruction—rather than as the sole teaching medium or as simply a null factor. "This integration of the storage capability of the computer, the tutorial capability of it, and the ability to get real live measurements and instant feedback comprises," says Tinker, "the most interesting application of a computer in science education."

Probably the most notable example of such a software/hardware package is the AtariLab Science Series. Developed by a team of educators headed by Dr. Priscilla Laws at Dickinson College in Carlisle, Pa., and marketed through Atari Learning Systems, AtariLab is a "laboratory science station" that lets junior high school to college age students conduct temperature and heat energy experiments with an Atari home computer (a version will also be available for Commodore and Apple machines). The AtariLab series comes in modules, the first of which includes a starter kit of AtariLab interface, software cartridge, temperature sensor, thermometer and instruction manual. The interface device, which plugs into the joystick port, is used to connect the temperature sensor to the personal computer for conducting experiments. The software cartridge contains the programs needed to perform the experiments and record observations. Other modules in the AtariLab series will permit investigation into subject areas such as light, low-level radiation, robotics and biofeedback.

Laws, who came upon the idea for AtariLab after conducting teacher workshops for Tinker at TERC, notes that the interactive benefits of hardware/software science packages like AtariLab can be derived on an individual basis if desired and are well-suited to either a classroom or home setting. "We were hoping in the long term that schools would be able to afford to get laboratory stations and use them in the science curriculum," she recalls. "Since that time, there has been much more awareness of the fact that parents want to have good educational software in the home also, just the way they would get good children's literature."

Atari Learning Systems, in fact, is planning to push the AtariLab package harder in the home, according to Laws, because of the system's lasting educational value and the acceptance of more inexpensive home computers like those from Atari and Commodore. "We consider (AtariLab) the electronic equivalent to the Gilbert Chemistry Set," she explains, "because you can do thousands of different things with it.

AtariLab-like products may prove the ideal way for personal computers and science software to aid in the instruction of science subjects. It is doubtful, however, that they will prove the only acceptable way; personal computers and software are too versatile to be slotted so easily. There is room, educators seem to agree, for nearly all types of science software packages, provided they meet the needs and circumstances of the person using the computer.

Clearly, the development of educationally sound science software for both the home and the classroom is in its early stages—in terms of quality and quantity. And the early stages have proven to be an exciting, though often disappointing time for publishers, educators, parents and students. But the fact that personal computers are becoming an increasingly prevalent factor in our society, coupled with the need for more and better science instruction, points to a frequent marriage of the two in the future. The task at hand is to make that marriage bear fruit for youngsters who need help in finding out more about the world around them. And that task, while shared to a certain degree by all concerned parties, rests largely with the people who write the software that drives the machine, says Dr. Michael Jacobsen, the executive director of the Center for Science in the Public Interest.

"The challenge to software writers is to develop programs that will give you an intuitive feeling for, say, the structure of an atom—something you couldn't get from a textbook or that's very hard to explain verbally," observes Jacobsen, the author of an ecology program called Eco-Paradise.

The challenge to the *consumer*—whether parent, teacher or student—is to find the science software that fulfills the promise of deeper understanding of an increasingly complex world. It is harder to do this in the area of science software than in language arts or math. The information which accompanies our Buyer's Guide will give you a feel for what's available and should help you in this pursuit.

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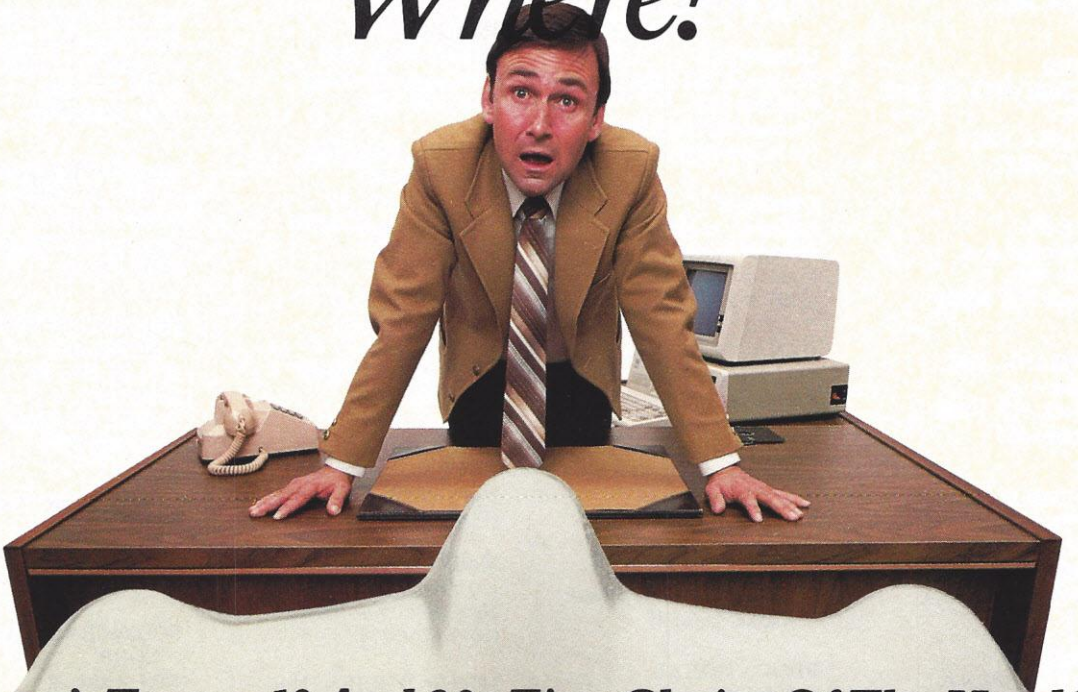

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Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
ADVANCED GENETICS Educational Materials and Equipment Co.	$77	APL II series	Biology	No	High school and college	Nine-part program on inheritance with experiment and testing models for each part.
ARGOS EXPEDITION CBS Software	$44.95	COM 64	Astronomy	Yes	Ages 10 to adult	Users share information with others and with the computer as they search for artifacts and travel on space adventures.
ASTRONOMY KEYWORD Focus Media, Inc.	$39	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Question and answer game designed to teach astronomy terms.
ATARILAB LIGHT MODULE Atari, Inc	$59.95	ATA 800XL	Physics	Yes	Ages 9 to adult	Explores concepts of light polarization and absorption.
ATARILAB STARTER SET Atari, Inc.	$89.95	ATA 800XL, APL II, COM 64	Physics	Yes	Ages 9 to adult	Student analyzes objects and events to learn concepts of temperature and energy transfer.
BAFFLES Conduit	$50	APL II series	Biology	Yes	High school and college	Develops deductive reasoning and problem-solving skills through scientific inquiry.
BALANCE IN NATURE, THE Focus Media, Inc.	$79	APL II series; COM 64	Ecology	Yes	Grades 5-8	Tutorial program teaches student about food chains, adapting to an environment and species change.
BALANCING CHEMICAL EQUATIONS Microcomputer Workshops Courseware	$29.95 (disk), $25.95 (cassette)	COM 64, PET	Chemistry	No	High school	The screen is used as a worksheet, the student interacting with the computer step by step.
BIOBITS I: LIFE Compress Div. of Wadsworth, Inc.	$60	APL II series	Biology	Yes	High school and college	Student plays game of "life," and explores passive and active growth, simple change and differentiation.
BIOBITS II: MAGIC FLAG Compress Div. of Wadsworth, Inc.	$35	APL II series	Biology	Yes	High school and college	Illustrates concepts of entrophy and randomness, showing how patterns destroy themselves when forced to change in accordance with their environment.
BIOBITS III: GROWTH Compress Div. of Wadsworth, Inc.	$60	APL II series	Biology	Yes	High school and college	Uses computer models to show relationships between the environment and population size change.
BIOBITS IV: INTERACTIONS Compress Div. of Wadsworth, Inc.	$60	APL II series	Biology	Yes	High school and college	Explains interaction between populations; and predator vs. prey relationship.
BIOBITS V: PROFILES IN POPULATION Compress Div. of Wadsworth, Inc.	$60	APL II series	Biology	Yes	High school and college	Teaches reproductive capability of population through simulation.
BIOBITS VI: EVOLUTION Compress Div. of Wadsworth, Inc.	$90	APL II series	Biology	Yes	High school and college	Illustrates evolutionary phenomena including selective and non-selective population change.
BIOBITS VII: NUCLEIC ACID CONNECTION Compress Div. of Wadsworth, Inc.	$70	APL II series	Biology	Yes	High school and college	Covers the nature and functions of nucleic acid bases, explores cause and effects of mutation.

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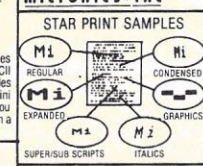

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Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
BIOBITS VIII: ANALYTICS Compress Div. of Wadsworth, Inc.	$60	APL II series	Biology	Yes	High school and college	Analyzes data using Fourier, normal curve, variance and chi square analysis, and regression statistics.
BIOLOGY—ENERGY AND LIFE Encyclopaedia Britannica Corp.	$125	APL II series	Biology	Yes	Grades 8-12	Explores bilogical energy reactions, enzymes, photosynthesis and metabolism.
BIOLOGY FACTS American Educational Computer	$39.95	APL II series; ATA 800, 880XL, 1200XL; COM 64; IBM PC, PCjr	Biology	Yes	High school	Designed to teach biology terms.
BIOLOGY—GENETICS Encyclopaedia Britannica Corp.	$125	APL II series	Biology	Yes	Grades 8-12	Covers Mendelian inheritance, mechanisms of genetics, sex determination and chromosomal abnormality.
BIOLOGY KEYWORD PROGRAMS Focus Media, Inc.	$39 (each)	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Uses word games to develop recognition of secret words by uncovering clues that include synonyms, examples, definitions and applications.
BIOLOGY PROGRAMS J & S Software	$250 (set); $28 (each)	Apple II series; TRS-80 Models III, 4	Biology	Yes	Grades 10-12	Fifteen programs in main areas of biology. Branching questions and more information format for learning and review.
BIOLOGY—THE CELL Encyclopaedia Britannica Corp.	$125	APL II series	Biology	Yes	Grades 8-12	Teaches cell theory and history, cell structure, organelles, viruses, plant and animal cells.
BIOLOGY, V.1 Prentice Hall General Pub. Div.	$39.95	APL II series; ATA; COM 64; IBM PC, PCjr;	Biology	Yes	High school	Teaches respiration, anatomy, mechanics of breathing and respiratory problems.
BIOLOGY, V.2 Prentice Hall General Pub. Div.	$39.95	APL II series; ATA; COM 64; IBM PC, PCjr	Biology	Yes	High school	Covers digestion and health in animals.
BIOLOGY, V.3 Prentice Hall General Pub. Div.	$39.95	APL II series; ATA; COM 64; IBM PC, PCjr	Biology	Yes	High school	Teaches animal reproduction and development.
BIOLOGY, V.4 Prentice Hall General Pub. Div.	$39.95	APL II series; ATA; COM 64; IBM PC, PCjr	Biology	Yes	High school	Covers the circulatory system and circulation in animals.
BOTANY FRUIT KEY Dynacomp, Inc.	$19.95	ATA	Botany	No	Ages 12 to adult	Teaches common and scientific names of plants, including 125 trees and shrubs.
CATLAB Conduit	$75	APL II series	Biology	Yes	High school and college	Genetics simulation allowing students to mate domestic cats selected by coat color and pattern.
CELL DEFENSE HesWare	$29.95 (COM 64), $34.95 (APL, IBM)	APL II series; COM 64; IBM PC, PCjr	Biology	Yes	Ages 10 to adult	Simulation game in which student defends body against infection.
CELL GROWTH AND MITOSIS Classroom Consortia Media, Inc.	$69.95	IBM PC, XT, PCjr	Botany	Yes		Provides instruction in surface area and volume of cells. Experiments deal with the size of cells, chromosomes in mitosis and stages of mitosis.
CELLULAR REPRODUCTION Cambridge Development Laboratory	$60	APL II series	Biology	Yes	High school	Two programs include a review of the relevant cell structures and an animated demonstration of cellular reproduction.
CHEMAZE Compress Div. of Wadsworth, Inc.	$50	APL II series	Chemistry	Yes	High school and college	Maze game designed to teach chemical properties and reagent.

BUYER'S GUIDE

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
CHEMICAL NOMENCLATURE SERIES Merlan Scientific Ltd.	$66.00	APL II Plus; COM 64; PET	Chemistry	Yes	High school	Teaches organic compound nomenclature—program displays nine types of compounds. Computer randomly creates alkanes, user is asked to enter correct name.
CHEMISTRY—ACIDS AND BASES Encyclopaedia Britannica Corp.	$59	APL II series	Chemistry	Yes	Grades 8-12	Exercises in calculation of pH values, trittration, manipulation of the equilibrium formula for water, acid/base equilibrium constant.
CHEMISTRY PROGRAMS J&S Software	$250 (set); $28 (each)	APL series; TRS-80 Models III, 4	Chemistry	Yes	Grades 10-12	Fifteen programs in main areas of chemistry. Query and information scheme for learning and review.
CHEMISTRY: SERIES I Focus Media, Inc.	$89	APL II series: TRS-80 Models III, 4; COM 64, PET	Chemistry	Yes	Grades 8-12	Three different games teach states of matter, atomic structure and bonding, and acids and bases.
CHEMISTRY—STOICHIOMETRY Encyclopaedia Britannica Corp.	$59	APL II series	Chemistry	Yes	Grades 8-12	Exercises in interpreting and writing chemical formulas, gram/mole conversions, thermal equations and combinations.
CHEMISTRY TUTOR, THE John Wiley & Sons	$25	APL II series	Chemistry	Yes	High school	Provides mathematical equations and offers tips on how to balance them.
CHEMISTRY, V.1 Prentice Hall General Pub. Div.	$39.95	APL II series; ATA; COM 64; IBM PC, PCjr	Biology	Yes	High school	Covers the atom and atomic models.
CHEMISTRY, V.2 Prentice Hall General Pub. Div.	$39.95	APL II series; ATA; COM 64; IBM PC, PCjr	Biology	Yes	High school	Discusses the Periodic Table.
CLASSIFICATION Minnesota Educational Computing Corp.	$36	IBM PC; APL II series	Biology	No	Grades 8-12	A data base inquiry program to enter, search and sort data, and generate reports. Results related to the process of scientific classification.
COEVOLUTION HRM Software	$49	APL II series	Biology	No	Grades 9-12	Instructional game set in an evolving predator/prey system.
CONNECTIONS Krell Software Corp.	$99.95	APL II series; COM 64; TRS-80 Models III, 4	Scientific reasoning	No	Ages 12 to adult	Teaches scientific reasoning and hypothesis formulation. Includes data bases on chemistry, mammals, geography and math tools.
DISCOVERING THE SCIENTIFIC METHOD: SNIGS . . . FLIRKS . . . BLURGS Focus Media, Inc.	$49	APL II series; TRS-80 Models III, 4	Scientific method	Yes	Grades 7-9	Tutorial on scientific method is followed by three problems to be solved by forming hypothesis, performing tests and analyzing results.
DISCOVERY LAB Minnesota Educational Computing Corp.	$44	APL II series	General Science	Yes	Grades 6-9	Introduction to science processes including observation, experimental design and hypothesis testing.
DUCKS Minnesota Educational Computing Corp.	$44	APL II series	Biology	Yes	Ages 12 to adult	Teaches identifying characteristics of ducks and the way humans interact with them.
EAR, THE Cambridge Development Laboratory	$40	APL II series	Biology	Yes	Grades 4-6	Tutorial on the ear. Versions for both monochrome and color monitors. Option B to learn either English or Latin terminology.
EARTH SCIENCE Minnesota Educational Computing Corp.	$45	TRS-80 Models I, III	Earth Science	Yes	Grades 3-9	1) Students locate earthquake epicenter, 2) identify 29 minerals, 3) five major constellations, 4) teaches concept of distance.

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
EARTH SCIENCE KEYWORD PROGRAMS Focus Media, Inc.	$39 (each)	APL series; TRS-80 Models III, 4	Earth science	Yes	Grades 8-12	Games with word discovery by uncovering clues including synonyms, examples, definitions of terms in either astronomy or mineralogy.
EARTH SCIENCES Atari, Inc.	$29.95	ATA 800 XL	Earth Science	Yes	Grades 7-9	Teaches definition of solar distances, identification of constellations and the composition and mineral formations of earth.
EARTH SCIENCE SERIES Cambridge Development Laboratory	$95	TRS-80 Models I, III (tape), 4 (disk)	Earth Science	Yes	Grades 8-12	Instruction and drill on 10 earth science topics.
ECO-PARADISE Center for Science in the Public Interest	$39.95	CP/M; IBM PC; APL II series	Ecology	No	Grades 7-12	Quiz game with questions on environmental issues.
ELEMENTARY BIOLOGY Atari, Inc.	$29.95	ATA 800XL	Biology	Yes	Grades 7-9	Teaches circulatory system of animals with two-chamber hearts and animal survival.
ELEMENTARY SCIENCE FACTS American Educational Computers	$39.95	APL II series; ATA 800, 800XL, 1200XL; COM 64; IBM PC, PCjr	General Science	Yes	Grades 3-8	Covers life sciences, space and earth, and physical sciences.
ELEMENTS OF MEDICAL TERMINOLOGY Applied Microsystems, Inc.	$40	APL II series	Medicine, Anatomy	No	High school and college	Recognition of medical and anatomical terms.
ENERGY AND ENVIRONMENT Compress Div. of Wadsworth, Inc.	$75	APL II series	Scientific reasoning	Yes	High school and college	Principles of quantitative reasoning including concepts of rates of change, functional dependencies and quantitative solutions are covered.
ENERGY KEYWORD Focus Media, Inc.	$39	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Question and answer game to help teach definitions in energy.
ENERGY SEARCH McGraw Hill	$240	APL II series; TRS-80 Model III	Energy	No	Grades 5-12	Student manages an energy factory and searches for new energy sources.
ENERGY SERIES Focus Media, Inc.	$69	APL II series; TRS-80 Models III, 4; COM 64, PET	Energy	Yes	Grades 7-10	Questions, graphics and games on heat energy and temperature, and sound energy and waves.
EXPERIMENTS IN CHEMISTRY HRM Software	$150	APL II series	Chemistry	No	Grades 9-12	Combines data gathering, analysis and graphing functions for 15 chemistry experiments.
EXPERIMENTS IN HUMAN PHYSIOLOGY HRM Software	$249	APL II series	Biology	No	High school and college	Allows student to measure and record physiological parameters.
EXPERIMENTS IN SCIENCE HRM Software	$249	APL II series	Biology, Physiology, Chemistry, Physics, Earth Science and Planetary Science	No	Grades 9-12	Student performs experiments in various science fields.
EXPLORING THAT AMAZING FOOD FACTORY, THE LEAF Science Management Corp.	$49.95	APL IIc, IIe; IBM PC, PCjr	Biology	Yes	Grades 7-12	Covers transport of materials in a leaf, structure of the leaf and stomate action in gas exchange.

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
FASCINATING STORY OF CELL GROWTH, THE Science Management Corp.	$49.95	APL IIe, IIC; IBM PC, PCjr	Biology	Yes	Grades 6-10	Covers surface area and cell volume, experimenting with cell size, chromosomes in cell division, stages of mitosis.
FORECAST CBS Software	$49.95	APL II series; COM 64; IBM PC, PCjr	Meteorology	Yes	Ages 12 to adult	Student charts weather patterns and learns how atmospheric conditions affect the weather.
GAS LAWS AND KINETIC MOLECULAR THEORY Merlan Scientific Ltd.	$99.00	APL II series; COM 64, PET	Chemistry	Yes	High school	Simulated experiments and drills in gas laws and illustrations of various concepts of kinetic molecular theory.
GENE MACHINE HRM Software	$65	APL II series; TRS-80 Models III, 4; COM 64	Genetics	No	Grades 7-12	Covers basic ideas about structure and function of nucleic acids, DNA and RNA.
GENE STRUCTURE AND FUNCTION Cambridge Development Laboratory	$195	APL II series	Biology	Yes	High school	Four-disk introduction to the basic concepts of molecular biology.
GENETICS Microcomputer Workshops Courseware	$29.95 (disk); $25.95 (cassette)	APL II series; COM 64, PET	Genetics	No	High school	Basic laws of genetics including dominant, recessive, sex-linked dominant, sex-linked recessive and sex-influenced characteristics.
GENETICS AND EVOLUTION Educational Materials and Equipment Co.	$97	APL II series	Biology	No	High school and college	Four-part program on genetic basis of evolution.
GREAT BIOLOGY KNOWLEDGE RACE: SERIES 1&2, THE Focus Media, Inc.	$39 (each)	APL II series; COM 64	Biology	Yes	Grades 9-12	Program topics include diversity of life, human physiology, nutrition and health, reproduction and development, evolution, and life and the environment.
GREAT CHEMISTRY KNOWLEDGE RACE: SERIES 1&2, THE Focus Media, Inc.	$39 (each)	APL II series	Chemistry	Yes	Grades 9-12	Program topics include matter and energy, atomic structure, chemical bonding, the periodic table, chemical math, kinetics and equilibrium, acids and bases, and oxidation and reduction.
HABER-TECH: SIMULATION OF AMMONIA Compress Div. of Wadsworth, Inc.	$70	APL II series	Chemistry	Yes	Grades 6-college	Chemical plant simulation teaches maximization of production in chemical industrial situation.
HEARTLAB Cambridge Development Laboratory	$55	APL II series	Biology	Yes	Grades 4-8	Animated tutorial on the circulation of blood in the human heart. Includes quiz and laboratory activity.
HEATLOSS Minnesota Educational Computing Corp.	$45	APL II series	Energy	No	Ages 12 to adult	Problem-solving program to determine areas and costs of home energy-saving improvements.
HEREDITY DOG HRM Software	$49	APL II series; COM 64	Genetics	Yes	Grades 7 to adult	Student mates dogs of different color and patterns and studies genotypes and phenotypes of pups and parents.
HOME AUTOMATIC WEATHER STATION Vaisala	$199.95	COM 64, VIC 20 (disk or cassette)	Meteorology	Yes	Ages 6 to adult	Hardware and software allow student to monitor, predict and learn about the weather.
HONEY FACTORY CBS Software	$49.95	APL II series; COM 64; IBM PC, PCjr	Biology	Yes	Ages 7 to adult	Student constructs a beehive and controls activities including searching for nectar and how much nector to store.
HOWS AND WHYS OF MIGRATING MOLECULES, THE Science Management Corp.	$49.95	APL II series; IBM PC, PCjr	Chemistry	Yes	Grades 6-10	Covers transport through a membrane, structure of molecules, equilibrium in osmosis, process of diffusion.

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
HUMAN ANATOMY Encyclopaedia Britannica Educational Corp.	$99	APL II series	Biology	No	High school	Describes skeletal, muscular, nervous, digestive, respiratory, circulatory and urinary systems with definitions and graphics.
HUMAN BODY, THE Cambridge Development Laboratory	$95	APL II series	Biology	Yes	Junior high and high school	Tutorial on human body. Topics are muscular system, digestive system, respiratory system, skeletal system, circulatory system and nervous system.
HUMAN BODY: AN OVERVIEW, THE Brainbank, Inc.	$90	APL II series; COM 64, PET	Biology	Yes	Grades 8-12	Initial introduction to the human body. Subsequent lessons introduce muscular, digestive, respiratory, skeletal, circulatory and nervous systems.
HUMAN SYSTEMS BIOLOGY KEYWORD Focus Media, Inc.	$39	APL II series; TRS-80 Models III, 4	Biology	yes	Grades 7-12	Question and answer game helps teach definitions in human systems.
IDENTIFYING MINERALS Focus Media, Inc.	$39	APL II series; COM 64, PET; TRS-80 Models III, 4	Earth Science	Yes	Grades 8-12	Students learn difference between rocks and minerals and the physical tests for minerals through a mountain climbing expedition game.
INCREDIBLE LABORATORY, THE Sunburst Communications, Inc.	$39.95	APL II series; ATA	Chemistry	Yes	Ages 11 to adult	Change in chemicals alter the features of three monsters.
INSECT IDENTIFICATION Focus Media, Inc.	$69	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Game setting in which student examines and learns characteristics of 75 species of insects.
INTERPRETING GRAPHS IN PHYSICS: POSITION AND VELOCITY VERSUS TIME Tandy/Radio Shack	$39.95	TRS-80 Models I, III	Physics	No	High school	Poses graph-related questions or simulations about rectilinear motion including position, speed, displacement and acceleration concepts.
INTRODUCTION TO GENERAL CHEMISTRY Compress Div. of Wadsworth, Inc.	$70 (each)	APL II series	Chemistry	Yes	High school and college	Eight-disk set covers Periodic Table, inorganic nomenclature, balancing equations, atomic weights.
INTRODUCTION TO SCIENCE SERIES Focus Media, Inc.	$39 (each), $159 (set)	APL II series	General Science	Yes	Grades 4-8	Game format teaches student about solar system, the earth, weather, prehistoric life and insects.
INTRODUCTION TO THE ELEMENTS Applied Microsystems, Inc.	$29.95	APL II series	Chemistry	Yes	High school and college	Drill and practice in general chemistry.
INTRODUCTORY GENETICS Educational Materials and Equipment Co.	$85	APL II series	Biology	Yes	High school and college	Five-part disk including patterns of heredity, sex determination and linkage, probabilities, genetic hazards and pure strains.
INVERTEBRATE BIOLOGY KEYWORD Focus Media, Inc.	$39	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Question and answer game teaches definitions in invertebrate biology.
ISAAC NEWTON Krell Software Corp.	$49.95	APL II series; COM PET; TRS-80 Models III, 4	Scientific reasoning	No	Ages 15 to adult	Teaches scientific induction. Children learn to discern laws of nature, formulate hypotheses.
LABMATE Atari, Inc.	na	ATA 800XL	Physics	No	Ages 9 to 15	Offers additional experiments for use with started set.
LABORATORY SIMULATIONS SERIES Merlan Scientific Ltd.	$99.00 (set); $20—$24 (each)	COM 64, PET	Physics	Yes	High school	Animated simulations of laboratory experiments in which students take measurements and prepare laboratory reports.

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
LEAF: STRUCTURE AND FUNCTION Classroom Consortia Media, Inc.	$69.95	IBM PC, XT, PCjr	Botany	Yes	Grades 8-12	Instruction in transport in the leaf, structure of the leaf, photosynthesis and action of the stomate in gas exchange.
LIFE FORCE HesWare	$29.95 (COM); $34.95 (APL, IBM)	APL II series; COM 64; IBM PC, PCjr	Biology	Yes	Ages 10 to adult	Student learns about bui life through on-screen activities including splitting a DNA strand and producing a protein chain.
MARK & RECAPTURE Conduit	$50	APL II series	Biology	Yes	High school and college	Estimate population size using three models: Lincoln-Peterson, Schnabel and Schumacher-Eschmeyer.
MATCHMAKER ELEMENTARY SCIENCE FACTS-GRADES 5&6 American Educational Computer, Inc.	$39.95	APL II series; ATA; COM 64; IBM PC, PCjr	Science	Yes	Grades 5-6	Lessons in life, earth/space, and physical sciences.
MATCHMAKER ELEMENTARY SCIENCE FACTS-GRADES 7&8 American Education, Computer, Inc.	$39.95	APL II series; ATA; COM 64; IBM PC, PCjr	Science	Yes	Grades 7-8	More lessons in life, earth/space, and physical sciences.
MATTER KEYWORD Focus Media, Inc.	$39	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Question and answer game to help teach definitions in matter.
MEASUREMENT Minnesota Educational Computing Corp.	$36	IBM PC	Scientific measurement	No	Grades 6-9	Introduction to the concept of scientific measurement by comparing student reaction time to a computer.
MEASUREMENTS; LENGTH, MASS AND VOLUME Focus Media, Inc.	$59	APL II series; COM 64	Scientific measurement	Yes	Grades 6-12	Teaches child how to measure metric length, mass and volume.
MEIOSIS Educational Materials and Equipment Co.	$45	APL II series	Biology	Yes	High school and college	Interactive simulation of gamete formation with four options: oogenesis and spermatogenesis, with and without nondisjunction.
MENDELIAN GENETICS Merian Scientific Ltd.	$45	APL II series	Genetics	Yes	High school	Lesson 1 is an introduction to Mendel's experiments. Lesson 2 reviews concepts and investigates dihybrid crosses.
MENDELIAN GENETICS: A PROBLEM-SOLVING APPROACH Compress Div. of Wadsworth, Inc.	$70	APL II series	Genetics	Yes	High school and college	Tutorial and simulated lab offers student a simple explanation of how populations grow and progresses until student can predict a variety of phenomena accurately.
MENDELIAN GENETICS-I Cambridge Development Laboratory	$60	APL II series	Biology	Yes	High school and college	Tutorial plus simulated library. Simulation covers dominance, partial dominance, lethality and sex linkage.
MENDELIAN GENETICS-II Cambridge Development Laboratory	$60	APL II series	Biology	Yes	High school and college	Tutorial and quizzes on experiments of Mendel. Includes simulation of one of Mendel's classic experiments.
MERLAN BIOLOGY SERIES Merian Scientific Ltd.	$45.00 (set)	APL II series	Biology	Yes	High school	Cellular Reproduction consists of two groups of programs: Mitosis and Meiosis. Includes review, animated demonstration and quizzes.
MICRO GARDENER, THE Educational Activities, Inc.	$59	APL II series	Plants	Yes	Grades 4-adult	Study plant growth, make decisions on planting, light, water, temperature.

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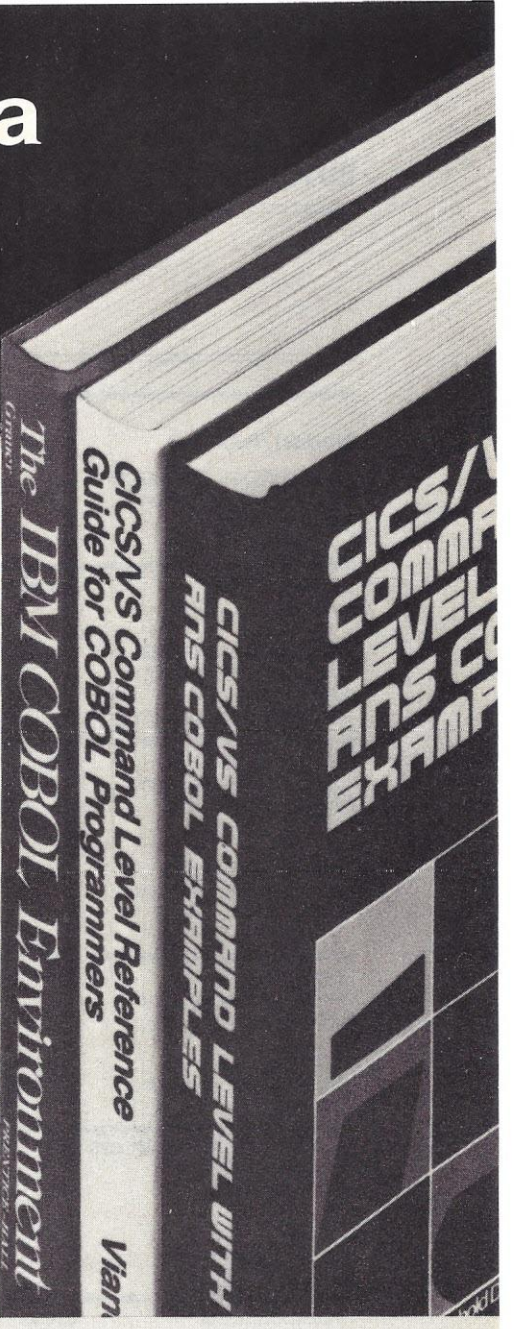

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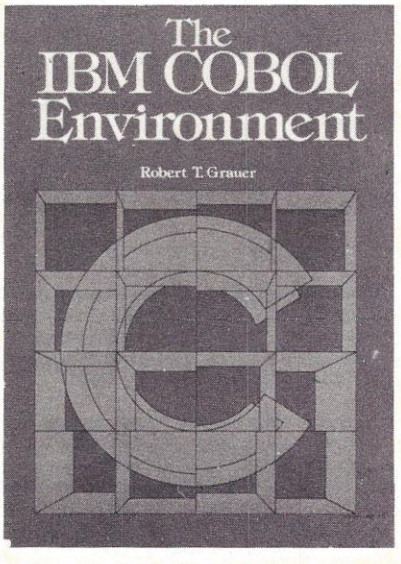
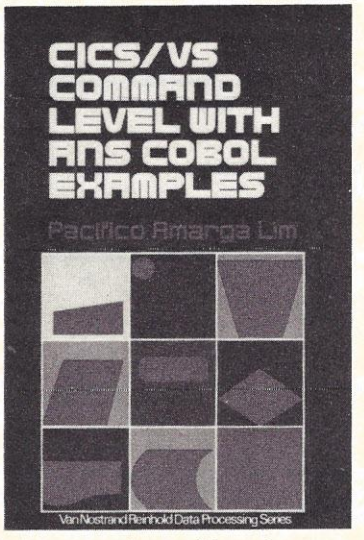


Robert T. Grauer's down-to-earth handbook that spells out the basics of COBOL language, OS JCL, utilities, procedures, VSAM organization, assembler fundamentals, even debugging. Liberally illustrated with easy-to-follow examples. Publisher's price: $21.95.

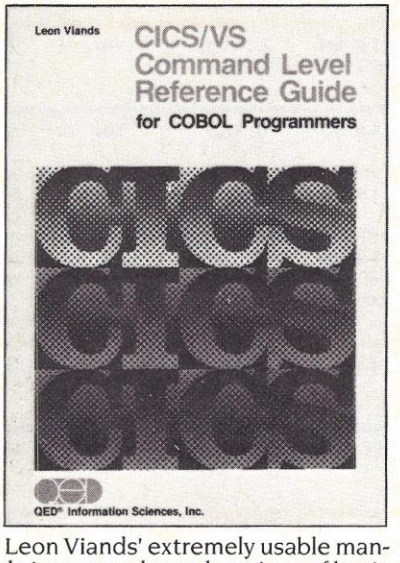
CICS/VS Command Level With ANS COBOL Examples.

Pacifico A. Lim's practical handbook shows you how to handle on-line (teleprocessing) concepts, how they're designed, how applications are fit into



existing networks, and how the many design features of CICS work. Publisher's price: $29.95.

CICS/VS Command Level Reference Guide for COBOL Programmers.



Leon Viands' extremely usable manual gives capsule explanations of basic rules for using CICS commands, what pitfalls to look out for, what the major options mean. An invaluable desk-top reference. Softbound. Publisher's price: $19.95.

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CIRCLE 29

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
MICROBIOLOGY TECHNIQUES Educational Materials and Equipment Co.	$45	APL II series	Biology	No	High school and college	Lab procedures covered including using pipets, bacterial growth phases, generation time, problem analysis and diagnostic identification procedures.
MICROSURGEON Imagic	$34.95	IBM PCjr, TI 99/4A	Biology	Yes	High school	Student travels inside human body, curing diseases.
MOLECULES AND ATOMS: EXPLORING THE ESSENCE OF MATTER Science Management Corp.	$49.95	APL IIe, IIc; IBM PC, PCjr	Chemistry	Yes	Grades 6-10	Covers molecules and atoms, the Bohr model, how to draw an atom, ions and ionic bonding.
NATURAL SELECTION Educational Materials and Equipment Co.	$40	APL II series	Biology	Yes	High school and college	Clarifies relation between natural selection and genetics. Includes parts on natural selection, effects of pollution on moth population.
NUCLEIC ACIDS, THE Educational Materials and Equipment Co.	$77	APL II series	Biology	Yes	High school and college	Explores nature of nucleotides, synthesis of RNA, its transfer and involvement with ribosomes, and researching mutation occurrences.
NUTRI-BYTES Center for Science in the Public Interest	$39.95	APL II series; CP/M; IBM PC	Nutrition	No	Grades 7-12	Advice on a nutritious diet; a quiz game which tests knowledge of nutrition.
NUTRITION Educational Materials and Equipment Co.	$35 (APL); $37 (TRS-80)	APL II series; TRS-80 Models I, III, 4	Biology	No	Grades 6-college	Basics of nutrition.
NUTRITION AND FOOD GROUPS Minnesota Educational Computing Corp.	$36	APL II series; IBM PC	Nutrition	Yes	Grades 6-9	Teaches nutrient content, review a food group and demonstrate the importance of making good food choices.
OH, DEER! Minnesota Educational Computing Corp.	$44	APL II series; IBM PC	Ecology	Yes	Grades 5-9	Students manage a herd of white-tailed deer.
OPERATION FROG Scholastic, Inc.	$39.95	APL II series	Biology	Yes	Ages 9 and up	Student simulates dissection of frog, then tries to reconstruct it.
OPTICS: MIRRORS AND BEAMS HRM Software	$75	APL II series	Physics	No	Grades 6 to adult	Teaches student physics of optical science.
OSMOSIS AND DIFFUSION Educational Materials and Equipment Co.	$41 (APL); $44 (TRS-80)	APL II series; TRS-80 Models I, III, 4	Biology	Yes	High school and college	Examines flow of matter across a semipermeable membrane. Introduces random motion, diffusion, osmosis; factors that influence movement into cell.
OUTDOOR BIOLOGY Minnesota Educational Computing Corp.	$45	TRS-80	Biology	Yes	Grades 2-9	Students take the role of an animal or a fish, encounter other organisms and discover their place in the food web.
PASSIVE TRANSPORT Classroom Consortia Media, Inc.	$69.95	IBM PC, XT, PCjr	Botany	Yes	Grades 8-12	Instruction in structure of molecules, process of diffusion, transport through a membrane, and equilibrium and osmosis.
PETS, LTD. Minnesota Educational Computing Corp.	$43	APL II series	Biology	Yes	Grades 5-9	Simulation of responsible action of pet care.
PHOTOSYNTHESIS AND LIGHT ENERGY Classroom Consortia Media, Inc.	$69.95	IBM PC, XT, PCjr	Botany	Yes	Grades 8-12	Simulations, activities and graphics illustrate characteristics of light and its role as an energy source.
PHOTOSYNTHESIS: UNLOCKING THE POWER OF THE SUN Science Management Corp.	$49.95	APL II series; IBM PC, PCjr	Biology	Yes	Grades 6-10	Covers light as energy, characteristics, wavelength used by chloroplasts, variables and controls.

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
PHYSICAL SCIENCE BASEBALL J & S Software	$29.50 (each)	APL II series	Physical Science	Yes	Grades 7-12	Competitive baseball game. Correct answers are comparable to hits. Question difficulty determines number of bases.
PHYSICAL SCIENCE KEYWORD PROGRAMS Focus Media, Inc.	$39 (each)	APL II series; TRS-80 Models III, 4	Physical Science	Yes	Grades 7-12	A game to learn energy or matter terms.
PHYSICAL SCIENCE PROGRAMS J & S Software	$250 (set); $29 (each)	APL II series	Physical Science	Yes	Grades 7-10	Fourteen physical science (chemistry/physics) programs. Teaches and reviews general concepts.
PHYSICS PROGRAMS J & S Software	$195 (set); $28 (each)	APL II series	Physics	Yes	Grades 7-12	Twelve physics programs. Stresses interpreting experiments and problem-solving. Utilities allow teachers/parents to track progress.
PLANETARIUM ON COMPUTER Focus Media, Inc.	$69	APL II series	Astronomy	Yes	Grades 7-12	Student learns about planetary mass, orbit and location through programs which allow student to travel through solar system and guess his or her age and weight on planets.
PLANT BIOLOGY KEYWORD Focus Media, Inc.	$39	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Question and answer game helps teach plant biology definitions.
PLANT GROWTH Classroom Consortia Media, Inc.	$69.95	IBM PC, XT, PCjr	Botany	Yes	Grades 8-12	Covers study of plant anatomy and physiology. Student studies hormone control, feedback mechanisms, transport and differentiation.
POPULATION FLUCTUATIONS Educational Materials and Equipment Co.	$47.50 (APL); $49.25 (TRS-80)	APL II series; TRS-80 Models I, III, 4	Biology	Yes	High school and college	Study factors of population growth.
POPULATION GROWTH: A PROBLEM-SOLVING APPROACH Compress Div. of Wadsworth, Inc.	$70	APL II series	Biology	Yes	High school	Laboratory simulation of exponential growth, density dependent growth, variations in carrying capacity, delays in regulatory response.
POWER GRID HRM Software	$59	APL II series; TRS-80 Models III, 4	Energy	No	Grades 6 to adult	Simulation of electric utility drawing resources from plants fueled by coal, oil, gas, nuclear power and water power.
PROJECT: SPACE STATION HesWare	$39.95	APL II series; COM 64; IBM PC, PCjr	Astronomy	Yes	Ages 10 to adult	Student builds and launches a space station, selects a crew, manages a budget and copes with problems of space.
REFLECTIONS HesWare	$29.95 (COM), $34.95 (APL, IBM)	APL II series; COM 64; IBM PC, PCjr	Physics	Yes	Ages 10 to adult	Science simulation teaches reflection, retraction and absorption through building of a sound and light show.
RENDEZVOUS Peachtree Software	$39.95	APL II series; ACE, IBM PC	General Science	Yes	Ages 13 to adult	Simulates orbital rendezvous and approach from lift-off through docking with a space station.
ROCKS AND MINERALS KEYWORD Focus Media, Inc.	$39	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Question and answer game teaches rock and mineral definitions.
SCIENCE PACKAGE I Micro Learningware	$45	TRS-80 Models III, 4	Electronics, Physics	No	Grades 6 to 8	Student learns about electronics and performs simulation of physics lab project.
SCIENCE PACKAGE II Micro Learningware	$50	TRS-80 Models III, 4	Chemistry	Yes	Grades 6 to adult	Program covers valance, atomic weight, symbols and atomic number.

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In 1983, more microcomputers enrolled in schools across America than all other years combined.

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A quality computer system created specifically for education by educators. The result is Acorn's British Broadcasting Corporation Microcomputer System. A total learning system that includes not only the most powerful, versatile micro for its size and price, but specially designed courseware as well. Courseware that includes teacher-approved lesson plans and workbooks.

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After educators in Phoenix, Arizona completed nine months of intensive study, they also chose Acorn. And according to School Board President Robert Hill, "Acorn's Econet is almost flawless in comparison to the networks offered by competing microcomputers."

And in Britain, 85% of all microcomputers being ordered by schools today are Acorns.

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ACORN COMPUTER

CIRCLE 95

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
SCIENCE PACKAGE III Micro Learningware	$45	PET (disk or cassette); TRS-80 Models III, 4	Physics	No	Grades 7 to adult	Drills and practice with various formulas dealing with physics.
SCIENCE TOOL KIT Broderbund Software	na	APL II series	Earth and Life Science	Yes	Grades 4-12	Students design tools on-screen, collect and analyze data about themselves and the world.
SCIENCE VOLUME I-BIOLOGY/PHYSICS Minnesota Educational Computing Corp.	$45	APL II series	Biology and Physics	No	Grades 7-12	Students control and manipulate variables affecting models including population dynamics of a buffalo herd and whale migration.
SCIENCE VOLUME II-BIOLOGY/PHYSICS Minnesota Educational Computing Corp.	$49	APL II series	Biology and Physics	No	Grades 7-12	Simulations explore, through trial and error, defining models and seeing the effects and interrelationships of the variables.
SCIENCE VOLUME III-EARTH/LIFE SCIENCE Minnesota Educational Computing Corp.	$49	APL II series	Earth and Life Science	No	Grades 7-12	Includes tutorial on blood circulation in animals with two-chambered hearts, a key to 29 common minerals and a food chain simulation.
SHORE FEATURES Cambridge Development Laboratory	$30	APL II series	Earth Science	Yes	Grades 4-8	Tutorial on identifying shore and beach features.
SKELETAL SYSTEM, THE Brainbank, Inc.	$70	APL II series; COM 64, PET	Biology	Yes	Grades 4-12	Five lessons on the skeletal system—bones, ligaments, joints and cartilage.
SKELETAL SYSTEM, THE Cambridge Development Laboratory	$75	APL II series	Biology	Yes	Grades 4-6	Tutorial on bones, joints, ligaments and cartilage.
SOLAR FOOD: AN EXPLORATION OF PHOTOSYNTHESIS HRM Software	$49	APL II series	Botany	Yes	Grades 9 to adult	Teaches reactions and significance of photosynthesis.
SOLAR SYSTEM ASTRONOMY Cambridge Development Laboratory	$50	APL II series	Astronomy	Yes	Grades 6-8	Topics include characteristics of the planet. Greenhouse effect, life in the solar system and comets.
SOLAR SYSTEM: THE DISCOVERY OF THE PLANET PLUTO Tandy	$59.95	TRS Color Computer	Astronomy	Yes	Grades 5-10	Accompanying book was written by discoverer of Pluto.
SOUTH DAKOTA Educational Activities, Inc.	$69	APL II series	Agriculture	Yes	Grades 7-12	Run a grain farm. Deal with weather and supply problems, hiring workers, peak seasons. Profit is the goal.
STELLAR ASTRONOMY Cambridge Development Laboratory	$50	APL II series	Astronomy	Yes	Grades 6-8	Includes types of stars, origin and types of galaxies, recognizing and naming constellations, visual binary stars, death of a star and Doppler effect.
STRUCTURE OF MATTER Classroom Consortia Media, Inc.	$69.95	IBM PC, XT, PCjr	Physics	Yes	Grades 8-12	Offers instruction in molecules and atoms, the Bohr Model, ions and ionic building.
TEMPERATURE GRAPHER HRM Software	$75	APL II seies	Energy	No	Grades 6 to adult	Student uses temperature sensitive probes (included) to perform experiments.
THREE MILE ISLAND Muse Software	$39.95	APL II series	Physics, Nuclear Energy	Yes	Grades 7-12	Simulates operation of nuclear power plant.

Product/Publisher	Price	Systems	Subject	Color Graphics	Age Group	Description
TIMEBOUND CBS Software	$32.95 (disk); $37.95 (cartridge)	IBM PCjr, ATA, COM 64	History and Science	Yes	Ages 10 to adult	Travel into the past or future and learn about air and space, scientific tools and communication.
TITAN EXPERIENCE Muse Software	$39.95	APL II series	Astronomy	Yes	Grades 7-12	Familiarizes student with planets and their moons.
TRANQUILITY BASE Peachtree Software	$29.95	APL Ii series	Astronomy	Yes	Ages 13 to adult	Student pilots lunar expedition.
TRIBBLES Conduit	$40	APL II series	Scientific method	Yes	High school and college	Introduction to the scientific method presents a problem and guide to its solution.
TRS-80 CHEMISTRY LAB Tandy/Radio Shack	$199.00	TRS-80 Models I, III	Chemistry	No	Grades 7-12	Simulations on kinetic theory, Charles' Law, Boyle's Law, titration, conductivity and solubility. Student-controlled variables.
VERTEBRATE BIOLOGY KEYWORD Focus Media, Inc.	$39	APL II series; TRS-80 Models III, 4	Biology	Yes	Grades 7-12	Question and answer game teaches vertebrate biology definitions.
WATER AND WEATHER SERIES Focus Media, Inc.	$89	APL II series; COM 64, PET; TRS-80 Models III, 4	Earth Science	Yes	Grades 7-12	Water cycle, humidity and clouds, and precipitation taught through learning games.
WAVES AND VIBRATIONS Merian Scientific Ltd.	$138	APL II series; COM 64, PET	Physics	Yes	High school	Sequence of programs teaches the fundamentals of periodic motion and waves with extensive use of graphics and animation.
WEATHER FRONTS Cambridge Development Laboratory	$30	APL II series	Earth Science	Yes	Grades 6-8	Animated tutorial on structure, characteristics and weather associated with various fronts.
WEATHER TAMERS CBS Software	$39.95	COM 64	Earth Science	Yes	Ages 10 to adult	Create and control environment. Learn about the atmosphere.
WILDERNESS: A SURVIVAL GAME Peachtree Software	$49	APL II series	Survival	Yes	High school and college	Student must survive in wilderness after a plane crash.
WINDOW TO THE GALAXIES Commodore Business Machines, Inc., Computer Systems Div.	na	COM 64	Astronomy	Yes	Grades 6-college	Choose any time period to view the position of the stars and planets.
WORLD CLOCK Compress Div. of Wadsworth, Inc.	$50	APL II series	Earth Science	Yes	High school	Teaches earth's movement, the sun's effect on the earth, progression of seasons and solar system relationships.
WRITING CHEMICAL FORMULAS Microcomputer Workshops Courseware	$29.95	APL II series	Chemistry	No	Grades 7-12	Practice in writing chemical formulas from a base of more than 120 compounds chosen at random.
YOUR BODY—SERIES I Focus Media, Inc.	$119	APL II series; COM 64, PET; TRS-80 Models III, 4	Anatomy	Yes	Grades 6-12	Learn about the human organism, digestive system, blood and the circulatory system through several different games.
YOUR BODY—SERIES II Focus Media, Inc.	$119 ($199 with Series I)	APL II series; COM 64, PET; TRS-80 Models III, 4	Anatomy	Yes	Grades 6-12	Question and answer game which teaches student about muscular, skeletal, nervous and endocrine systems.

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CIRCLE 125

Presentation Graphics

A wide range of hardware and software makes it easier than ever for businessmen to tell their story with graphics presentations

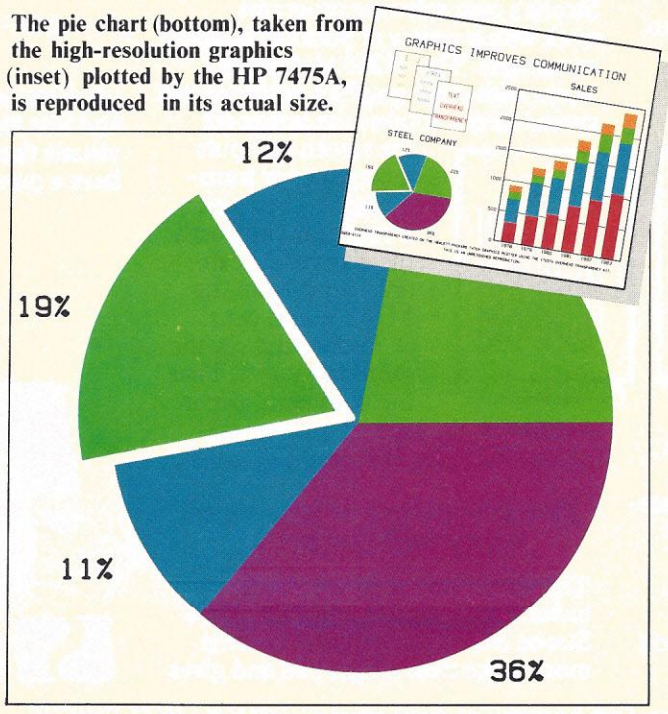
by Lisa B. Stahr, Associate Editor

Everyone's been through it at least once, but more likely a dozen times. There you were yammering away in a high-powered meeting when it suddenly dawned on you that you weren't getting your point across. You knew what you'd been trying to say, or at least you had an idea, and yet you hadn't put the right words together to make the concept clear to your listeners.

Or there was the time when you really had been saying what you meant to say, but for some reason your listeners misinterpreted your statements. Instead of explaining your new idea, you spent your presentation time tactfully telling your client or boss that what he thought he heard you say wasn't what you said at all.

Getting the point across is the single most important goal in any meeting or presentation. Whether it's a department manager who needs a bigger budget or an advertising agency that's seeking a new account, the person making the pitch must present his ideas clearly and coherently if he is to get what he wants from the powers that be. That's why so many business professionals augment their talks with visual aids—graphics that can tell the story even if words fail the speaker.

A recent study conducted by the University of Pennsylvania indicates that people using visual aids in their presentations are perceived as being more professional, persuasive and effective than those without. Not too surprising if you think about some of the more complicated concepts that are presented in a conference room. Imagine an electrical engineer explaining to three or four marketing types how his new traveling wave tube amplifier differs from the competition's. He could try to get through the presentation with words, but they'd probably understand him better if he used pictures. Or think of the financial officer who hands out sheets of paper with the annual sales figures for the preceding year and current year, pointing out the $1,309,862 jump in sales this year. For people who aren't used to reading numbers, the figures can lose their significance when written down—they're just too big to comprehend. But if the same information was presented in a simple bar graph the increase could be seen, not just imagined. Whether the concepts are simple or complex, graphics make them easier to grasp.



The pie chart (bottom), taken from the high-resolution graphics (inset) plotted by the HP 7475A, is reproduced in its actual size.

For years personal computers have been used to crunch the numbers for sales reports or to manipulate the data needed to design new traveling wave tube amplifiers, but they were rarely used to generate or display graphics. Less than five years ago, the most you could do in terms of graphics was to transfer your VisiCalc data to VisiPlot and print out a simple

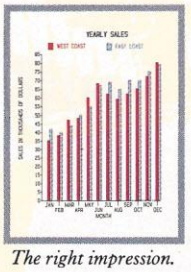
"Your graphics made my decision easy."

Save your breath and save his time. Say it with multicolored, convincing business graphics produced by your Strobe Graphics System.

Do the board members really have time to study your forecasts during the meeting? Do the investors really have the time to study the proforma right now? Does your audience ever have the time to study rows and columns of figures... and do you have the time to explain it to them? Not usually.

That's why your business presentation should contain informative, interesting and effective graphics ...not a difficult task with your Strobe Graphics System.

The hard facts.



The right impression.

Express yourself with style.

Two things happen when you give a presentation: you make a statement about the subject and you make a statement about yourself. Do it with flair.

That means that you have to sit in the director's chair... because you WILL want to make a last minute change to "just that one graph" or you will want to experiment with color combinations to achieve the greatest impact. It's inevitable! And for your producer... the Strobe Graphics System will insure that yours is a production of distinction.

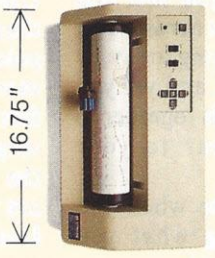
What has your computer's graphics program done for you lately?

Strobe's own software programs work with a variety of personal business computers. The M260 plotter also works with other graphics packages and spreadsheets. It takes the image off the screen and puts it on paper or transparency... bringing it to vibrant life, with the clarity that can only come from the M260's eight pens.

And we did say the *graphics system.* That includes pens, paper and film of the highest quality: materials that resist bleeding and tearing.

One more piece of hardware, where will you put it?

Thanks to contemporary drum technology—almost anywhere. The Strobe M260 plotter takes up little more space than a legal pad and gives you sharp lines and smooth curves. The graphics communicate what you want them to—beautifully.



One demonstration will make your decision easy.

Call Strobe at (800) 451-8108 for the dealer nearest you. He'll show you how easy it is to create charts, graphs, and text that transform your words into visuals that call for action. Don't you have a presentation coming up soon?

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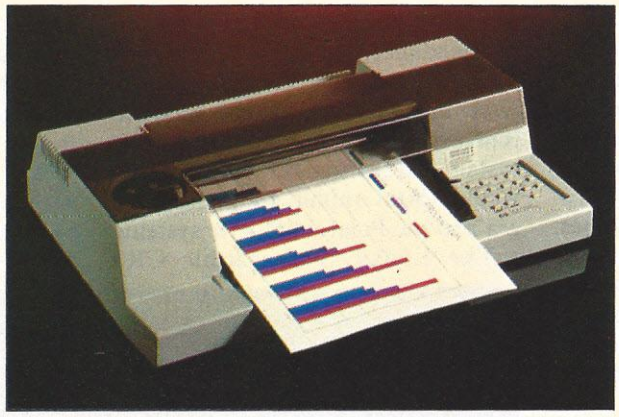
CIRCLE 33

line chart or bar graph. In those days, the graphics were analytic with little or no emphasis on presentation quality.

But things are changing in personal computers and one of the areas of greatest change is graphics. Now there are higher resolution screens, faster computing speeds, programs that do nothing else but create presentation-quality graphics and devices that capture the clarity and color of those graphics on film. Instead of generating the numbers and then sending them off to the art department to be turned into something visual, business professionals are using their personal computers to create their graphic presentation materials in less time and for less money. And as computer-generated graphics continue to get better looking, less expensive and easier to create, you'll see more of them cropping up in daily business routines. If they'll help you get your point across, odds are good you'll use them.



The HP 7475A Business Professional's Plotter has a six-pen carousel for changing colors or pen thicknesses.

The right graphics

Sometimes the way you present your information is just as important as the information you're presenting. You may think you're really something for wheeling your personal computer into the conference room to show the graphs you created, but your associates aren't going to think much of you for making them squeeze together to view the screen. That's why it's important to create just the right kind of graphics material for your particular presentation.

There are four types of graphics output devices that you can use to put together a presentation with computer-generated graphics: dot-matrix printers, plotters, slide-producing cameras and systems that project the image directly from your computer to a movie screen. Which of these devices you choose should depend on how often you use graphics in your presentations and how clear the images need to be. Obviously, a company that has presentations given once a year doesn't need an elaborate graphics output setup, whereas a firm that gives presentations twice a week might.

Fancy graphics

If your presentation doesn't need to be fancy, you can just print your VisiTrend/VisiPlot charts and graphs out on a dot-matrix printer and make enough copies for everyone at the meeting. If you're concerned about creating something jazzier than a simple line graph, then consider using a program like BPS Business Graphics from Business and Professional Software, Inc. This package allows you to fill in images with shaded or colored area coverings, add floating labels and legends, even reduce or enlarge the size of the images so that two or more graphs will fit on a page. Such fancy graphic representations won't be much good unless you have a printer that can reproduce them.

While most dot-matrix printers can reproduce the simpler graphics generated by your computer, such as line and bar graphs, pie charts and pictures, the trend is in creating dot-matrix machines with higher-quality printing capabilities. Apple's Scribe, for instance, is a relatively low-priced ($299) thermal transfer dot-matrix printer that can produce multi-colored presentation-quality graphics in less than four minutes. The system, compatible with any computer that has an RS-232-C interface, features six graphics modes: four low-resolution and two high-resolution, including one that can print 160 by 140 dots per inch. Scribe also has the added value of being able to print on just about any smooth surface, which means you can use transparent acetate instead of printer paper to make transparencies for use with overhead projectors. Transparent acetate can be used with most major copy machines and costs anywhere from 80 cents to $3.90 per copy to produce. In terms of a more professional look, though, transparencies beat hand-outs hands down.

Like the Scribe, the Quadjet printer from Quadram Corp. can print high-resolution graphics in seven colors—black, red, green, yellow, cyan, blue or magenta—and can print on transparent acetate. The device is compatible with both IBM and Apple personal computers (and with several of the more popular productivity packages, such as Lotus 1-2-3 and PC Draw), but the computers must run the special Quadram software that comes with the printer to print data. Unlike the Scribe, however, Quadjet is an ink jet printer, a technology that makes the printer quieter than the Scribe but more expensive ($895).

Printers vs. plotters

Printers such as Scribe and Quadjet are considered low-end graphics output devices despite their seemingly high-resolution graphics capabilities. When you compare the outstanding line resolution and color quality produced by plotters, you'll understand why these printers look like kid stuff.

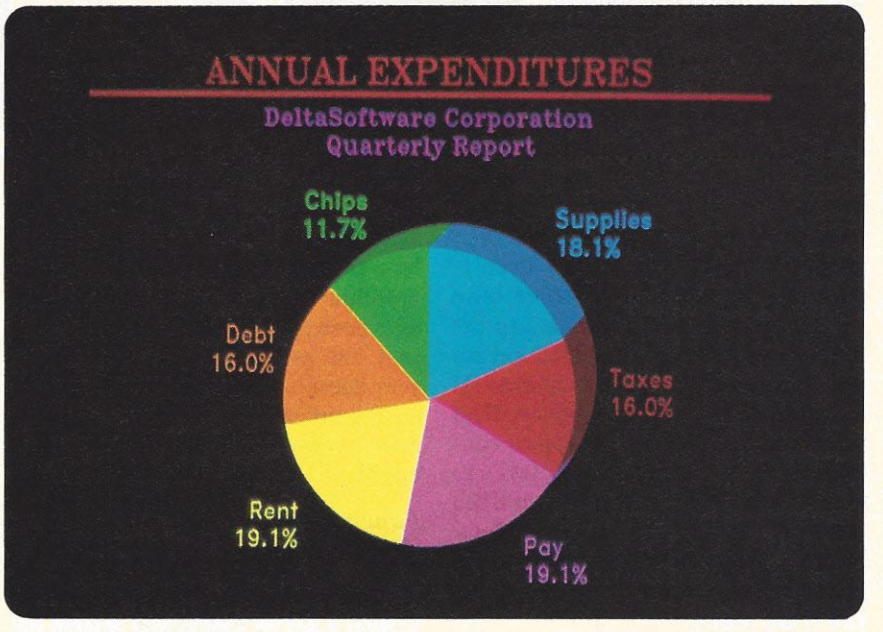
Plotters produce the same kind of graphic representations as dot-matrix printers (that is, hard copy printouts on paper or transparent acetate) but their results are of a higher quality. To draw, graphics plotters use several pens, usually two to six, which produce brighter colors and sharper lines. Because dot-matrix printers create images with a series of dots, for example, curved edges come out perceptibly jagged; the pens used in plotters draw continuous lines so graphics have smoother, cleaner edges.

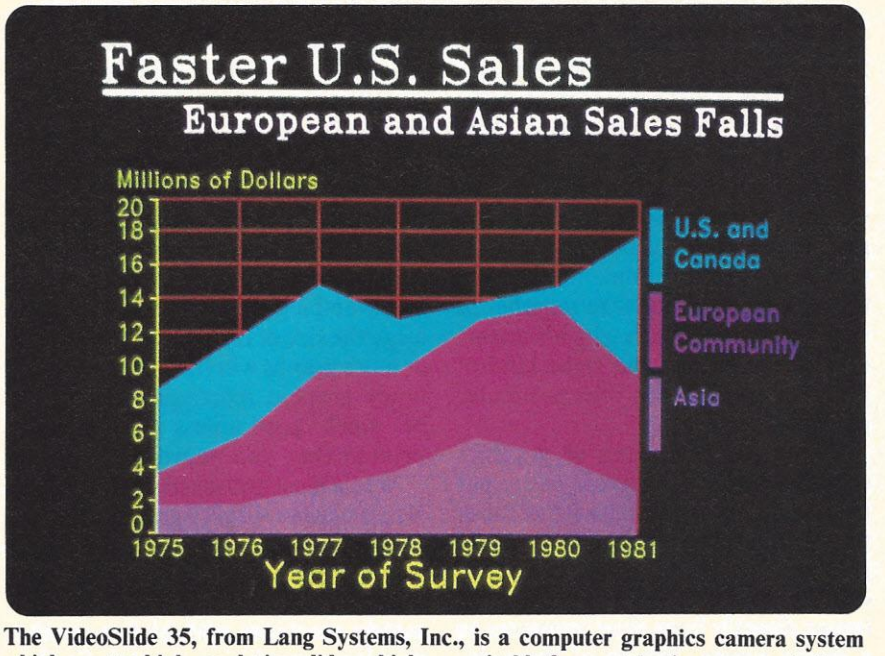
Hewlett-Packard, one of the leading manufacturers of plotters, makes two for personal computer users: the HP 7470A and the HP 7475A. The 7470A Personal Computer Plotter ($1095) plots on regular letter-size paper using one of two pens in its carousel. You can, however, change the pens during plotting for multicolored plots. The $1895 Business Professional's Plotter (the 7475A), on the other hand, has a six-pen carousel that allows you to change pens, either to insert a new color (up to 10 are available) or to change from a thin tip pen (used for detailed drawings such as those in engineering diagrams) to a thick tip pen (used to create bold headings in business graphics). The 7475A also plots on transparent acetate and on letter- and legal-size paper. Both systems can be used with IBM, Apple, Compaq, Osborne, Commodore and Hewlett-Packard personal computers and run with VisiCalc, BPS Business Graphics and ChartMaster software.

Slides

You can reproduce clean, eye-catching graphics with a printer or plotter, but for some business professionals the output from these machines just isn't sophisticated enough to use for high-level presentations. If you're one of these people, consider using a camera system that produces slides of the images created by your computer. Slides are a better presentation medium than hand-outs or transparencies when more than three people are in attendance, and, as a rule, they give a cleaner, more professional look to your presentation. There are currently several slide-producing camera systems on the market, including the Kodak InstaGraphic, the Lang Camera and the Polaroid Palette systems.

The Kodak Instagraphic CRT Imaging Outfit is simply an instant-exposure camera with a plastic cone that fits over any 12″ to 13″ computer monitor or television screen. It's not fancy, but what do you expect for $190? All you do to take a picture with the Instagraphic is hold the cone against the monitor and press a button. Within seconds an instant-expo-





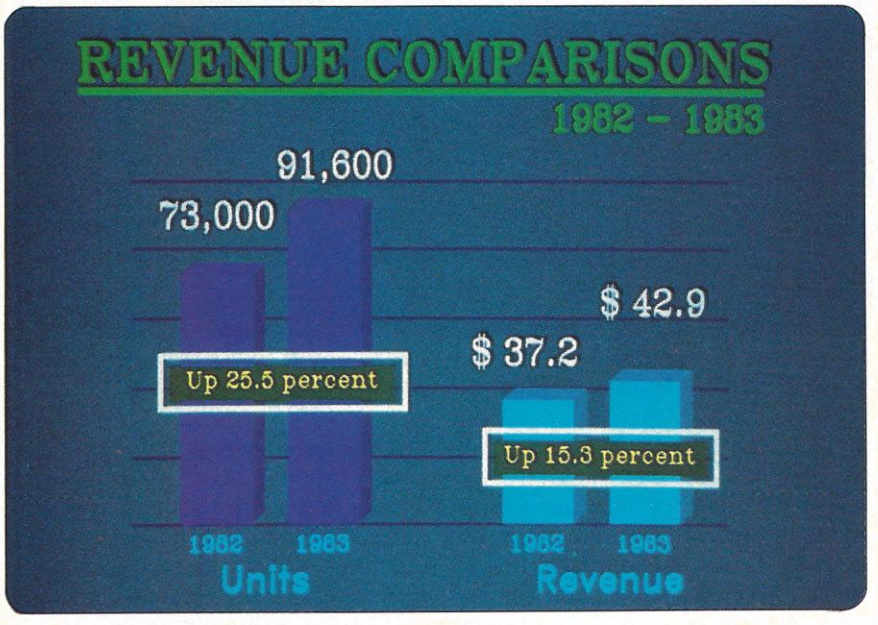
The VideoSlide 35, from Lang Systems, Inc., is a computer graphics camera system which creates high-resolution slides which are suitable for most business presentations.

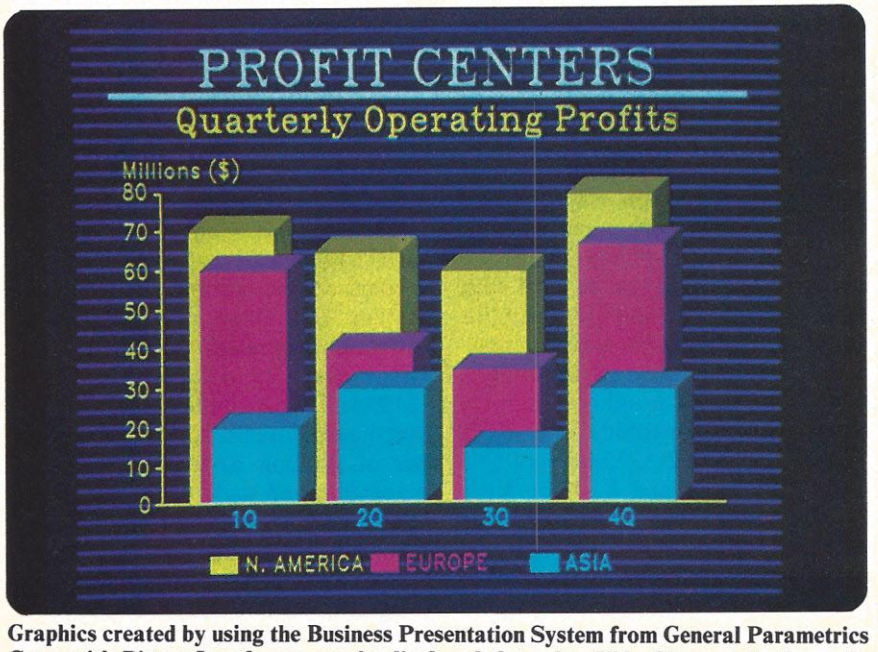
A camera system producing slides of computer-created images can provide a clean, professional look.

sure print of the screen image appears from the camera. The print is a fairly low-quality reproduction of the image because the camera picks up normal curvature of the computer screen. Also, the colors on-screen aren't accurately reproduced by the system.

One other flaw to the Instagraphic setup is its instant-exposure camera. Unless you attach your own 35mm camera to the cone, you can't take slide or conventional print pictures with the device, a weakness that is sure to affect the popularity of this Kodak product. Before discounting the Instagraphic completely, however, try to look over a few slides it produces. You may find that the quality is good enough for informal presentations.

Although the Instagraphic CRT Imaging Outfit is simple in its design, operation, and unfortunately, in its results, it should get some credit for not requiring any special hardware or software to run with a computer.





Graphics created by using the Business Presentation System from General Parametrics Corp. with PictureIt software can be displayed through a VideoShow projection unit.

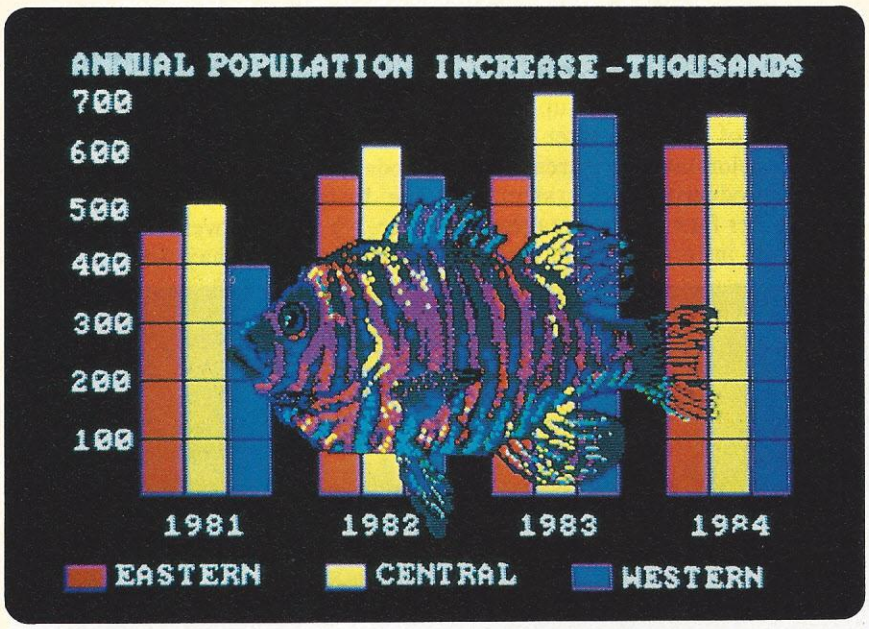
Lang's VideoSlide 35

There's a remarkable difference in price between the Instagraphic and the next step up in slide-producing cameras, but there's also a remarkable difference in quality. The VideoSlide 35 from Lang Systems, Inc., a computer graphics camera system that hooks up to your personal computer just like a monitor, can produce high-resolution color slides within 30 minutes at a cost of less than 50 cents per slide. The base price for the system, however, is $2799.

Once the VideoSlide 35 is connected to your computer, all you do to take a picture is push a button. The images created by the computer are then transferred to a flat, 7″ screen within the Lang system unit and the attached 35mm camera snaps away. How clear the camera's slides are depends a lot on the resolution of your monitor. Before receiving your system, Lang outfits it with a medium- or high-resolution camera, so if you have a high-resolution color monitor you'll receive a high-resolution camera.

The beauty of the Lang system is not just in its slides, though. The fact that you don't have to be a camera buff to use it makes it even more attractive. Once the system is set up with your computer it's very easy to use. Like the Kodak Instagraphic, the Lang doesn't require any special software to operate and can be connected to most personal computers, including the Apple II, Apple Lisa, TI Professional and IBM Personal Computer. In fact, because it simply recreates your computer-generated image on its own screen, the VideoSlide 35 can be used with any software package you can run on your computer.

Only when you decide to take advantage of some of its more advanced features, such as controlling the red/green/blue color balance of the photographed images, do you need to be familiar with color photography. Likewise, you'll need to know more about the Lang and about photography in general to use one of the optional accessory modules that can be purchased from Lang Systems. These modules, which attach to the back of the system unit, allow you to take full advantage of the camera's very technical capabilities, including raster fill and selectable synchronization. If high-quality slides are what you need for your presentations, the basic VideoSlide 35 unit may be the answer; if very high-quality slides are required, check out what these extras can do for you.



The Mindset computer, from Mindset, Inc., can be used to create free-hand drawings as well as standard business graphics with up to 512 colors, 16 at a time.

Polaroid's Palette

The Kodak Instagraphic system is easy to use and gives you low- to medium-quality graphic reproductions. The Lang VideoSlide 35 is also easy to use but gives you high-quality graphic reproductions. The Polaroid Palette Computer Image Recorder is difficult to use but gives you the highest quality graphic reproductions of all. What's more, at $1499 it's a lot cheaper than its Lang counterpart.

With the Palette you can choose from 72 colors to paint your graphics, you can produce color prints instantly when using instant print film and you can create mounted 35mm slides within minutes. The system works just like the VideoSlide 35 in that it recreates the image generated by your computer on its own high-resolution (up to 920 by 700 lines) screen and takes the picture. Because it has a higher resolution screen than the Lang system and because it uses special print and slide film, the Palette produces higher-quality slides and prints for about the same price per slide as VideoSlide 35.

Some of the features of the Polaroid Palette could be considered drawbacks to the average business user. For instance, the system gives you many more photographic choices than does the Lang, but those choices make the Palette much harder to use. Imagine being able to paint your images with any of the 72 colors the system offers or with colors you created by "mixing" the originals. But then imagine not being able to see the image you colored until after you take a picture of it.

Also, the Palette requires its own special software to run, which means it isn't compatible with every personal computer or graphics program around. The system can be used with IBM, Apple II, IIe and IIc, Franklin and DEC Rainbow personal computers, but only if they are running a Polaroid-approved graphics program. BPS Business Graphics (PC-DOS version), Lotus 1-2-3 (Versions 1 and 1A), PFS:Graph and VisiPlot/VisiTrend are just a few of the approved programs.

The Palette is an excellent system to use for very high-quality graphic reproduction, but it also takes an expert in photography to run it. If you're looking for a system that turns out good work and that can be used by anyone in your company, look to the Lang; the Palette, although the top of the line in slide-producing camera systems, is more of a one-person show.

If you're really sold on Palette but wish it was easier to master, Digital Research, Inc., known for its CP/M operating systems, has a product for you. The Polaroid Palette system is also being sold by DRI under the name Presentation Master. The complete DRI package, available only for IBM Personal Computers, comes with the Polaroid computer image recorder, 35mm instant slide-making system, DR Draw and DR Graph software programs, documentation, tutorials and diagnostic disks ($1995). DR Draw allows you to draw and manipulate lines, text and a number of symbols and also to control placement and scale of the computer screen's individual picture elements. You can change colors, line styles, text fonts and fill patterns with this program, too. DR Graph, on the other hand, lets you create and edit line graphics, scatter plots, pie charts and

What's the best recommendation you can make when you're asked about business graphics?

The New Business Professional Plotter from Hewlett-Packard— The 6-Pen HP 7475A

Today, business professionals are becoming more aware of the vital importance of business graphics to their success. Tomorrow, they may be asking for your recommendation. Here's some important information that will help you. Tell them...

Make a first impression that lasts

Truly impressive graphic presentations can create a first impression of quality and professionalism that lasts and lasts. The way you present your information can be equally as important as the information you're presenting. And that's where the new HP 7475A Business Professional Plotter lets your professionalism shine through.

Standards unsurpassed in the plotter business

The technical standards of the HP 7475A have no equal for producing quality graphics. With a resolution of one-thousandth-of-an-inch, curved lines are smooth, not jagged, and straight lines are *consistently* straight. Its exceptional repeatability (the ability of a pen to return *precisely* to a given point), assures that intersecting lines and circular shapes will meet *exactly.*

Compatible with almost any personal computer in your office and supported on today's most popular graphics software packages

The HP 7475A quickly "makes friends" with most of the personal computers you may already have in your office, including IBM®, Apple™, Compaq™, Osborne®, and Commodore™—as well as a host of HP computers. You even have a choice of many off-the-shelf software packages that give you "first-day" productivity with the HP 7475A.

Your Choice: 2 media sizes

While most professional business applications will be satisfied with standard 8½ x 11" paper or transparencies, the HP 7475A adds the capability of plotting on larger 11 x 17" media, too.

The cost? Surprisingly affordable

The new HP 7475A Business Professional Plotter is an amazingly affordable $1895. When you consider the high cost of having your graphics prepared by an outside service, you'll find the return on your investment is almost immediate.

Another choice: HP's low-cost, high performance Personal Computer Plotter

For the "business on a budget," you may also want a look at our 2-pen Personal Computer Plotter, the HP 7470A. Its low-cost (only $1095) is as remarkable as the quality of its plots. With many of the same features as the new HP 7475A, the HP 7470A plots on media up to 8½ x 11." It stores and caps two-pens, and you can easily change the pens for multi-color plotting.

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For a FREE sample plot, overhead transparency, and more details, mail the coupon below. We'll also enclose a list of software packages you can use right "off-the-shelf."

For the name of your nearest Hewlett-Packard dealer call toll-free 800-FOR-HPPC.

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YES! I want to make the most informed business graphics recommendation I can. Please send me your FREE "Better Presentation Package," so I can learn more about the new HP 7475A Business Professional Plotter and the HP 7470A Personal Computer Plotter. I understand I will receive this valuable package without cost or obligation.

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Address _____

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My computer is _____

Send to: Hewlett-Packard, 16399 W. Bernardo Drive,
San Diego, CA 92127
Attn: Marketing Communications

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bar graphs by controlling the placement of axes, labels and annotations.

Projecting an image

Computer-image projectors are the latest entrants in the graphics output race, but they're coming on hard and fast. The general principle of these systems is to project the image created by your computer to a monitor or movie screen so that groups of more than three people can view the image.

The LimeLight computer projector from Vivid Systems, Inc., is capable of projecting images from four feet to 10 feet diagonal onto any flat or curved surface, such as a wall or movie screen. All you do to get the system going is plug it into the composite-video output found on the back of most personal computers, turn LimeLight on and focus. You can control the brightness, contrast and size of the projected image with one of the four knobs located on the projector. LimeLight's high-resolution (700-line) projector contains several lenses that enable it to focus in the corners as well as in the center of the projection. Unfortunately, the projections are in the standard monochromatic green color only, color images aren't supported.

The advantage of the LimeLight system (and of all computer screen projectors for that matter) is that it echoes the computer's images: If you change a graph on the computer, the projected image of the graph changes, too. This means you can run your favorite program and make changes as go along.

At $3950, the LimeLight computer projector is one of the more expensive systems of its kind, especially since it's limited to monochrome displays. It does run, however, with almost all personal computers and software, including spreadsheets, word processors and graphics packages. For slightly less money ($3295), you can buy a system that displays color images on any color television, color monitor or video projector.

The Business Presentation System from General Parametrics Corp. consists of the VideoShow projector and PictureIt graphics software. With PictureIt running in an IBM Personal Computer or compatible with at least 128k RAM, you can create a business presentation on-disk in less than 30 minutes. Twenty-five different text and graphic images are provided.

To give the presentation you simply insert the disk into the VideoShow projection unit, which in turn displays the information on the computer monitor, television set or video projector to which it is connected. The VideoShow system, with its MacroVision technology, uses microdots instead of pixels to produce high-quality, slide-like projections and can display up to 1000 colors on-screen at once. Using a remote device you can control the presentation, including moving a pointer, displaying graphics out of sequence and building overlays on-screen. At present, PictureIt is the only graphics software that can run with the VideoShow system, but General Parametrics is encouraging designers to create other compatible programs.

Computer-image projectors are the latest entrants in the graphics output race, but they're coming on strong.

Draw your own

One interesting feature of all graphics output devices, including printers, plotters, cameras and projectors, is that they don't limit you to the usual pie chart/bar graph presentations. Many business professionals think only of pie charts and bar graphs when they create their presentations, forgetting that there are so many other shapes and images to be used. You also can create free-hand drawings, graphic designs, even animated picture shows for use with projection systems, provided you have the right graphics software and personal computer working together.

Art Department, Business and Professional Software's business graphics package that's designed to run with the Apple LisaDraw program, has a library of graphics images such as human forms, clocks, telephones and a map of the United States. Using the program you can create images and text of varying sizes and shades to add to the images already created with LisaDraw. Some of the categories of images are decorative elements, graphs and axes, dotted lines and shapes, and maps and flags.

If Art Department doesn't suit your needs, then maybe a computer with two special graphics microprocessors and an 80186 microprocessor will. The Mindset computer, from the company of the same name, has a high-resolution (640 by 400 pixel) monitor and can display up to 512 colors, although only 16 at one time. Using one of the many graphics programs designed specifically for the Mindset, such as Lumena from Time Arts or GW Basic from Microsoft, you can draw free-hand or define objects and move them around the screen. The computer is also compatible with the standard productivity packages WordStar, Lotus 1-2-3, MultiPlan, VisiCalc and dBASE II.

There are a slew of graphics products now available, with even more coming out every month. For the user, these new and varied options mean having a choice between creating a simple bar graph or a three-dimensional floating pie chart and between giving a presentation with paper hand-outs or presenting a completely animated explanation of your ideas. Like the personal computers that create and run them, presentation graphics are fast becoming valuable and versatile business tools.

The Best Sorts For Data Bases

Here are some examples of the sorting capabilities that unlock the analytical power of a data base

by Charles A. Miller, Associate Editor

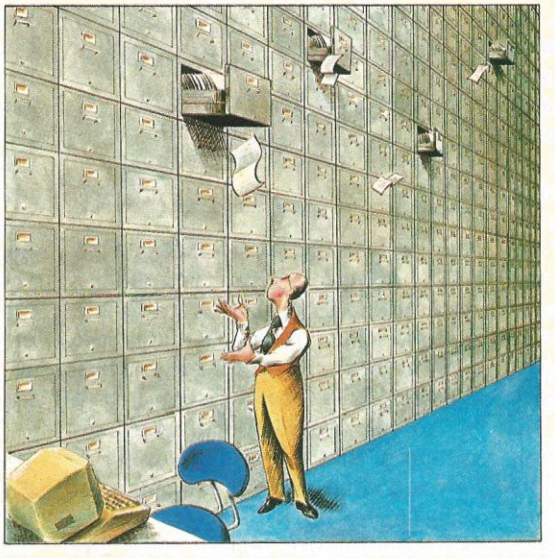


Illustration by Martha Gradisher

Data base management programs are often called electronic filing cabinets. That may be an effective way to describe them to newcomers to computing, because if nothing else it equates them with something familiar. But, except in the cases of the simplest data base programs, it is an inaccurate description. Today's powerful data base management systems have about as much in common with filing cabinets as spreadsheets have with an accountant's ledger sheet. The superficial resemblance is there, but the power of the computerized variety is exponentially greater if you know how to utilize it.

The spreadsheet gave its users the power to immediately see the results of changing numbers or assumptions in vast financial projections. Before the spreadsheet any such changes might take weeks to calculate by hand. Thus, it offered managers the opportunity to play the what-if game, and to become better informed about their business as a result. Data base management programs offer managers the same kind of power, by allowing them to instantly examine links between disparate data items and files—a herculean task by hand.

This means that like spreadsheets, data base management programs allow you to examine possibilities and to see trends that were previously hidden from your view by mountains of time and work. The difference between the two is that while the spreadsheet is mostly used for making projections about future trends, a data base is historical in nature: Its power is centered around the ability it gives you to examine and draw insights from recorded historical data. Where a spreadsheet lets you make predictions of where your business will be in the future, a data base management program lets you see where it is today, and more importantly, why. They're different, but complementary, analytical tools.

The primary functions of a data base management program are to store and sort information. The second of these, the sort function, is the real source of the power that a data base management program gives the user. For instance, anyone in the sales field can, with a little effort, maintain customer records in paper files. And even if you have hundreds of such files, you can sort them alphabetically by hand. Given a little time, you could sort out your top 50 customers, even if your paper files didn't contain total purchase figures for each customer. But suppose you wanted to examine the records of only those customers with whom you did less business in the fourth quarter than in the second quarter and whose purchases of items "A", "C" and "F" declined in that time while their purchases of items "B" and "D" increased? That kind of information could be of great value in helping you understand recent trends in your business. But if you're working with paper files, it's also the kind of information that you might not think to examine, because finding all the files that matched those criteria by hand could take days. Even if you were willing to wait that long for the information, you simply couldn't afford the time it would take to

compile it in a usable form.

A good data base management program, on the other hand, could give you that information in minutes. And it could give you those customers whose purchases of items "B" and "D" increased while their purchases of the other items decreased, as well as those customers who purchased increased or decreased quantities of all the items you carry, so you could look at those lists side-by-side and answer the question, "What's going on around here?"

Front end: the arena

There are two distinct areas of activity involved in using a data base management system. These are commonly referred to as front-end and back-end data base management. The front-end activities consist of planning your data base, designing report forms and entering data records. The back-end is the realm of the sort function: It consists of using the data you've previously stored in your data base. The back-end is the power area, but much of its power derives from how well you've done your work on the front-end.

How, specifically, do you set up a data base manager to best use its power? That depends on a number of factors, including the kind of data base program you're using, the kind of information you want to get out of it and the form in which you want that information. And that, obviously, means that you have to have a pretty good idea of how you will use your data before you select or set up your data base.

There are three general types of data base management systems. The first type consists of simple file management systems on the order of PFS:File (Software Publishing). These are the easiest to use data bases, but also less powerful. Both their ease of use and their lack of power come from their simplicity: They deal with only one file at a time. (Relational data base management systems, on the other hand, can work with data from several data base files.)

With file managers, the job of setting up a data base is relatively easy. All you have to do is design your input form, select a few data entry fields to work as key fields (i.e., to act as indexed keys on which the data base can be sorted), design a report form or two and you're ready to go.

The usefulness of your data base in the long run will largely depend on how well you plan it from the start.

The second general type of data base management system is the forms-oriented relational data base, such as PowerBase from PowerBase Systems. This type of system is similar to the simple file management system in that everything you do revolves around predesigned entry and report forms, but it differs from its less powerful relative in that data base management systems of this type can work with more than one data file at a time, provided that you have established how the files with which you want to work are related while setting up your entry or report forms.

For instance, say you're working with two files, one of which consists of a list of your customers, and the other of orders you've received from those customers. If you established how these are related when you set them up, you could have your data base program automatically fill in the customer's name, address, phone number, etc., on the order entry form after you've entered the customer number. (The method by which you would do so would differ from program to program, but basically you would tell the program to open up the customer list file and fetch the customer name, address, etc., that matched the customer number you had entered.)

With both simple file management packages and forms-oriented relational data base packages, the usefulness of your data base in the long run is largely dependent on how well you plan it from the start. At a minimum, you should lay out the entry and report forms on paper before you begin entering them into the program. Especially with forms-oriented relational data bases, it's important that you determine in advance where particular data items on a report or entry form are to originate: from the user's keyboard entry, as the sum or average of other numbers on the form or from other files. Plus, when you have the ability to work with several files, you have to decide in the course of setting up each one whether your operation would be more efficient by breaking a large file into smaller, related forms, or whether it would be more efficient to join several smaller files into one large one.

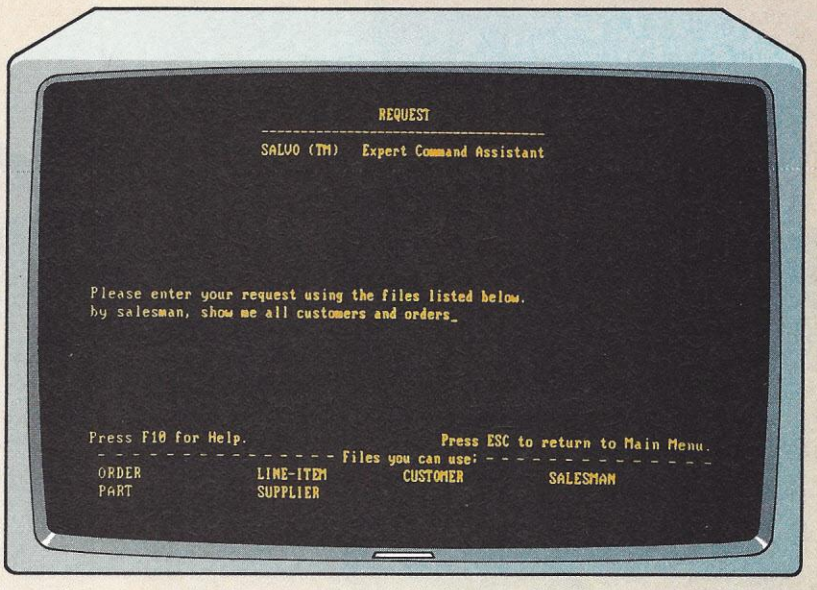
No matter how much preplanning you do, it's a good idea to experiment a bit with the results of that planning before committing large amounts of data (and thus, large amounts of time and keystrokes) to the data base format you've come up with. Wayne Erickson, chairman and CEO of Microrim (Bellevue, Wash.), publishers of R:base, advises, "You rarely have the right structure the first time you do it. Don't be afraid to go back and change things, if the program allows it. Put in some data—a limited amount—and try it, see if it works right before you commit the rest of your data to that form."

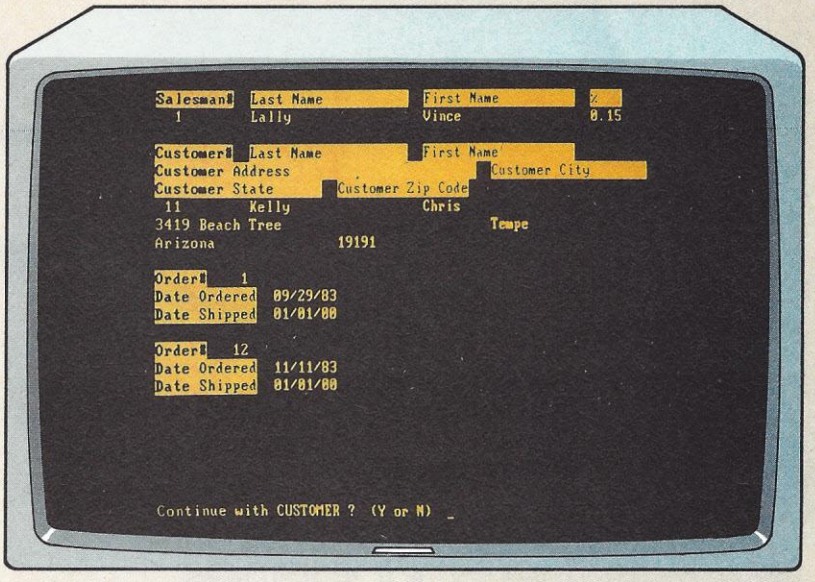
Some programs allow you to change the structure of your data base files after you've started to enter information, while others don't. But even those that allow changes can't guarantee that the data you've already entered into the data base is

consistent with the new structure you've given it. For instance, if you reduce the amount of spaces allowed for an entry into "Company Name," about all a program can do with a name longer than the amount of spaces allowed in the new structure is shorten it, which may not be what you want done to it. Thus, some experimentation after you've entered 10 or 20 records makes a lot more sense than waiting until you've entered 1000 records to discover a major omission or problem in the data base you've created.

This need for stringent preplanning is slightly less urgent in the third and final type of data bases: free-form, query-oriented relational systems such as Salvo from Software Automation Incorporated. Rather than relying on predesigned data entry and report forms, systems of this type allow you to make requests for data reports at the spur of the moment, provided that you have previously established how the various files from which you request information are related. For instance, if you had files called Items, Customers, Salesman, and Sales, you could type in a request such as "List all sales with customers and salesman by item number." The result would be a list of all the sales for each item you carry broken down by item number, with the salesman and customer for each sale.

Setting up a data base is about as much fun as grinding basil, garlic and pine nuts for hours with a mortar and pestle. But the benefits of using a well designed data base are as intoxicatingly enriching as the pesto that results from that laborious effort. Of course, you can, if need be, just knock off a quick and dirty data base, just as you can you can quicken the pesto-making effort by throwing all the ingredients into a blender and grinding them up in seconds. But in both cases, the hurriedness of the effort is apparent in the result. The subtle blending of flavors, or the subtle links between data, are nowhere to be found. A good





With a query-oriented database such as Salvo, the user is released from the restrictions of a single data form and free to make requests for reports containing data culled from any of the currently active files. However, as is true with forms-oriented data bases, the usefulness of this capability is highly dependent upon the amount of effort and forethought that went into planning the data base files to be used. Salvo can only report on files for which a "relation" has been established during the file creation process. For instance, in order for Salvo to create a report listing all orders by customer and including the salesman's name, a file called "orders" would have been "related" to one called "customers" and to one called "salesmen." The key is to anticipate your future needs when you're setting up your data base. The degree to which you're successful in that task will determine just how useful your data base is in the long run.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data base, like good pesto, takes time to make, and in both cases, in the end you're amply rewarded for the effort you expend.

Back-end: the power play

The benefits derived from data base management begin when you put your data base to work. It's important to remember that a data base management program, once you get beyond simple filers, does not have to be a passive store of information, but rather, it can be an active management tool. You can use query functions, for instance, not only to poll the data base, pulling out selected bits of information, but also to append the new information in its new form to a separate data base, or to inject facts into a new structure and help identify new relationships among data items.

What the data base can do, then, is shed light on the mass of information stored in it. A data base manager can give you a brand new way of looking at old data—new relationships and new perspectives that you would not ordinarily be able to discern among voluminous reams of apparently unrelated data. It can make having vast amounts of data useful, because you can solve the puzzles that an overwhelming amount of information can create, and spot trends that are not obvious from just looking at the raw data. With paper files, on the other hand, each additional chunk of data just seems to make the whole mass of data more confusing.

It takes time to learn how to use a data base management system effectively. Part of the learning curve is the time it takes just to learn which questions to ask. You've got to let your imagination run wild, forgetting all the ingrained cautions you've developed over the years (like, "If I ask my assistant to put together this much data by Tuesday she'll threaten to walk out") and realize that your data base program can give you almost any answer you want today.

You do, of course, have to exercise some restraint, but the restraint that's called for is not in the requests you make for data, but in how you interpret that data. A flexible data base will give you the the power to look at any two pieces of data side-by-side, but it's up to you to interpret that data intelligently. As some wise old sage once pointed out, a fool with an introductory course in statistics and just enough of the wrong data can easily demonstrate a direct correlation between the increased use of rubber-coated safety pins for attaching diapers to babies in the middle part of this century and an increase in traffic fatalities. But with a little discretion you can avoid being led astray in that manner, and simply reap the benefits that come from having all the information you need whenever you need it.

A flexible data base provides the power to look at any two pieces of data side-by-side. It's up to you to interpret it.

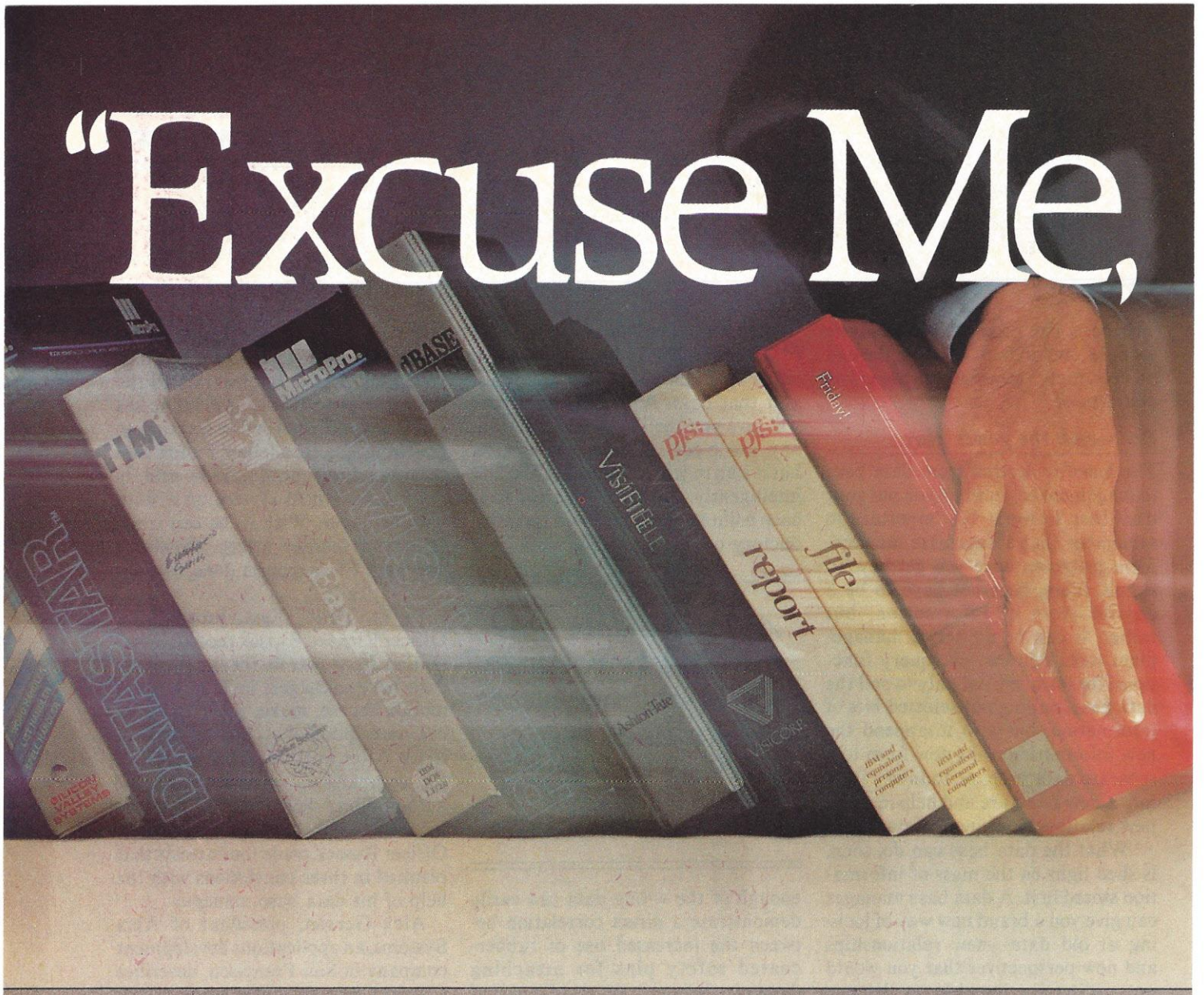
Those benefits can be tremendous, but only you can determine how they relate to the work you do. A data base management program is a generic tool, applicable to a wide range of uses. Larry Bethiel, manager of operations for Optimum, a data base manager published by Uveon Computer Systems (Denver, Colo.), says, "A fellow I know who runs a marine salvage yard gets calls all the time for parts such as propellers. Propellers have basic specifications—diameter, pitch and the like—so he can use his data base system to quickly locate them. When he gets a call, he types in a dozen or so characters and in moments his computer shows him a listing of the propellers that he knows about that meet those specifications. He's able to give information to the customer immediately on what he has available and what he's expecting to get for it. Another fellow I know distributes household goods and is putting his whole system on a data base manager. With it, he can track sales and reorder levels, inventory, and have most reports done for him automatically."

In Ft. Bend, Tex., meanwhile, Officer Richard Russek records information from patrols for input on his data base manager, including automobile license, make, model, year of car, description of occupants and activity. After work he prepares profiles for comparison to descriptions of automobiles, stolen items, possible suspects. In the first month of use, Officer Russek made four arrests that resulted in three convictions with the help of his data base manager.

Alex Gerson, president of Alex Systems, an applications development company in San Francisco, describes another use of data base query functions: "A psychologist I know analyzes data on shift workers. He goes to a plant and conducts interviews. He finds out the how well the workers are doing with the current schedule, how satisfied they are, how alert they are. He gets a general idea of the satisfaction of the workers. He may call up the information ten different ways and do some statistical analysis from the data base. He can break it down into groups—for instance, reporting the information for supervisors only. It used to take two weeks to do, but now only takes a few hours and he uses the data to come up with a new and improved shift schedule."

The benefits of data base management are clear: If you take the time to plan your data base wisely and to use it creatively, it can be the most effective analytical tool you have at your disposal, a big advantage in any occupation.

"Excuse Me,



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knowing all that storage power is there? Just in case you ever need it?

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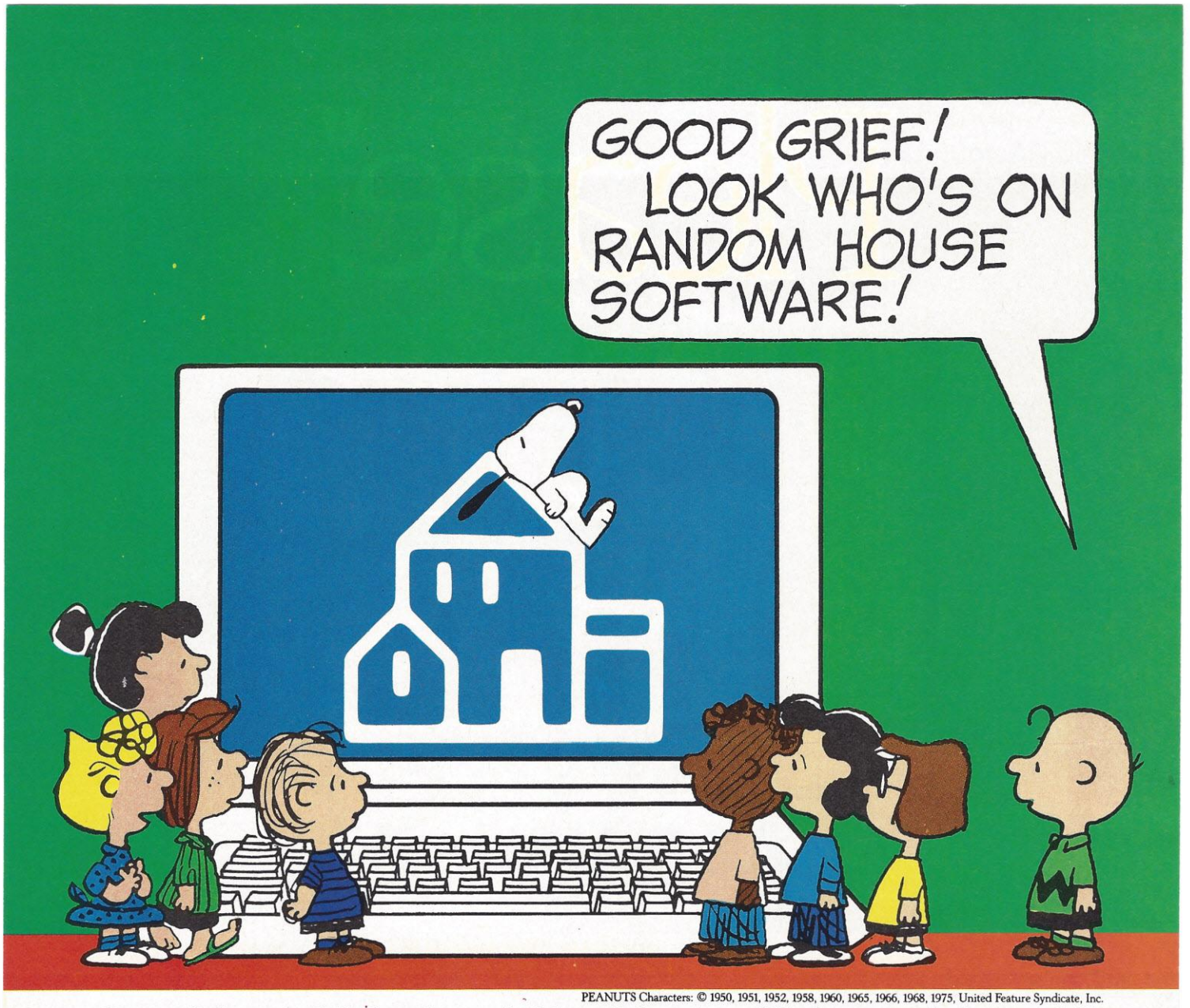

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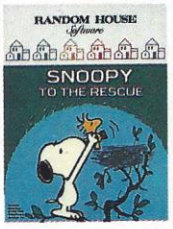

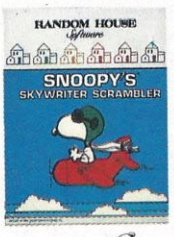

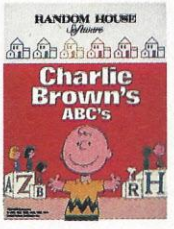

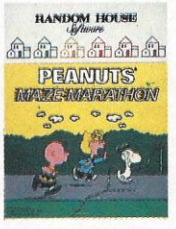

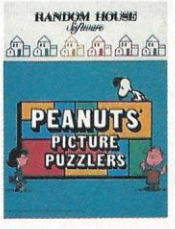

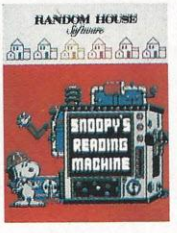

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CIRCLE 26

Managing Your Money By Computer

The smart way to shape up your own bottom line

by David Gabel, Contributing Editor

If I make so much money, then why do I feel so poor. "When you start asking that question," says Connie S.P. Chen, president of Chen Planning Consultants, Inc., a New York financial planning firm, "then that's one way to know you need a financial planner." Let's put it a slightly different way. If you're asking yourself that question, then you need to start managing your money.

Most people don't. Professional financial planners will almost unanimously agree with that statement. Most people just don't manage their money.

Why not? Probably it's just too much of a bother. I mean, you have to worry about where you spent the money. You have to keep records. You have to think about taxes. You have to set goals. You have to be disciplined. It doesn't sound easy.

Your computer can help

We can take heart in this bit of knowledge, however. While there are a lot of things a computer won't do in money management, it will make money management easier. It won't take all the pain away, but it will help. A computer, used in a money management role, will present information to you on which you can base sound long- and short-term financial decisions. And that capability—to look at your financial situation in a logical, consistent manner—is an absolutely necessary step in getting a handle on managing your money.

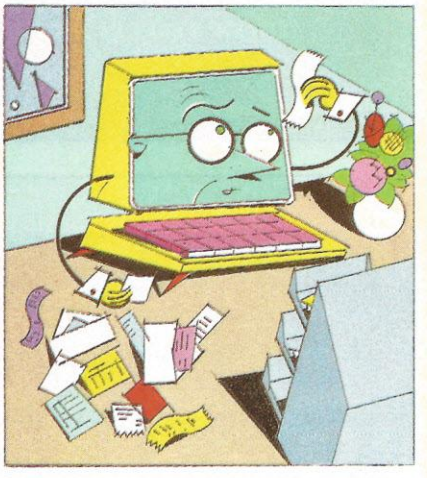


Illustration by Terry Allen

"It's a tool to use," says Chen. "You can't computerize a personal financial plan, but you can use the computer to get the information you need. We use it here for number crunching and record keeping."

Money management is no different from any other kind of management. If you want to manage any kind of activity, then you have to go through certain steps.

Chen says the first thing her company does for a client is to gather information about the client's financial situation so the information can be presented in a useful manner. The information she requires includes wills, tax returns for the last four years, investments, alimony figures, etc. She provides her clients with a "required forms checklist" of the forms they have to provide.

"Then we develop what I call financial X-rays," she says. These documents show a person's financial structure in-depth, what the person owes versus what he owns, his income and expenses, his tax structure and potential liabilities and, finally, an estate diagram that demonstrates who gets what if the client dies, including Uncle Sam.

This step is important because the fact is most people don't manage their money and most people don't know what their financial situation is. Do you know what your net worth is? Do you know the cash value of your life insurance policies. How much is your house worth? Your car? The jewelry you just inherited? Do you own stocks or bonds? What are they worth? Just how big are your long- and short-term liabilities? What are your expenses?

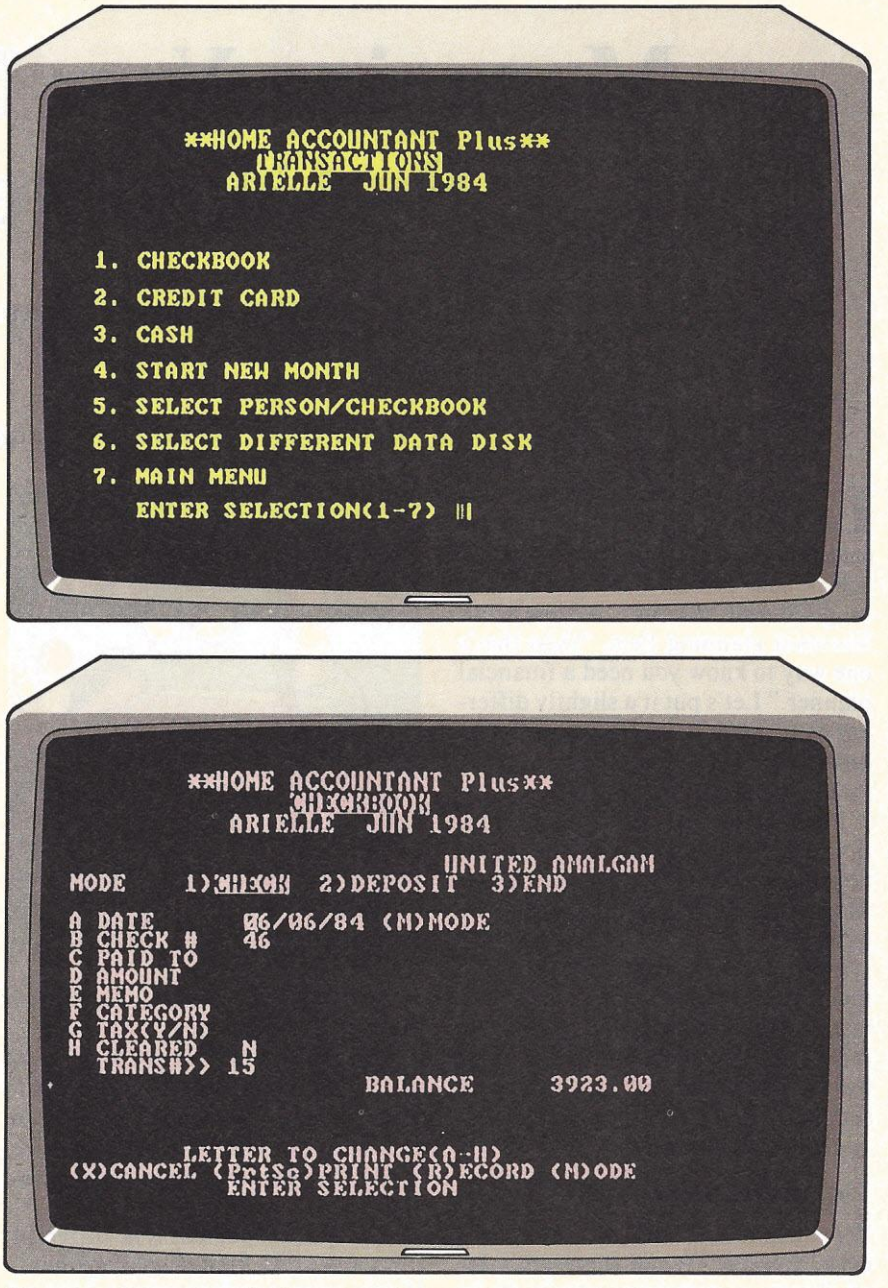
Computer as record keeper

This information gathering phase is the first place that a personal computer can help, whether you want to use the services of a financial planner for your money management or not. Any of a number of personal financial packages will prompt you to enter all the information that Chen says is necessary.

"The first place I think a computer

can help in money management," says Dick Lane, partner in the New Jersey accounting firm of Schierloh and Lane, "is in the balance sheet and net worth statements. It can help you delineate your assets and liabilities. Managing your money really means managing your assets. Using a computer, you can find out which of your assets are liquid (readily convertible to cash) and which aren't. Computers can help you develop a personal financial statement."

Three programs that come to mind that can help you with this requirement are The Home Accountant from Continental Software, Personal Accounting from BPI, and Dollars & Sense from Monogram Software. Eachof these programs allows you to enter different kinds of asset, or money, categories for developing your financial statements. All of them permit the entry of assets like your house, car, stock portfolio; liabilities, like your home mortgage, credit cards, car loan (they may break out credit cards as a separate category, the way Home Accountant does); checking accounts (an asset); income, like salary, stock dividends, interest income; and expenses, like food, clothing, rent, mortgage, utilities, etc. After you've set up your assets and liabilities in such a program, then you can get a printed statement of net worth from the program (the program may call it a personal balance sheet) which shows what you own, what you owe, the difference and your net worth.



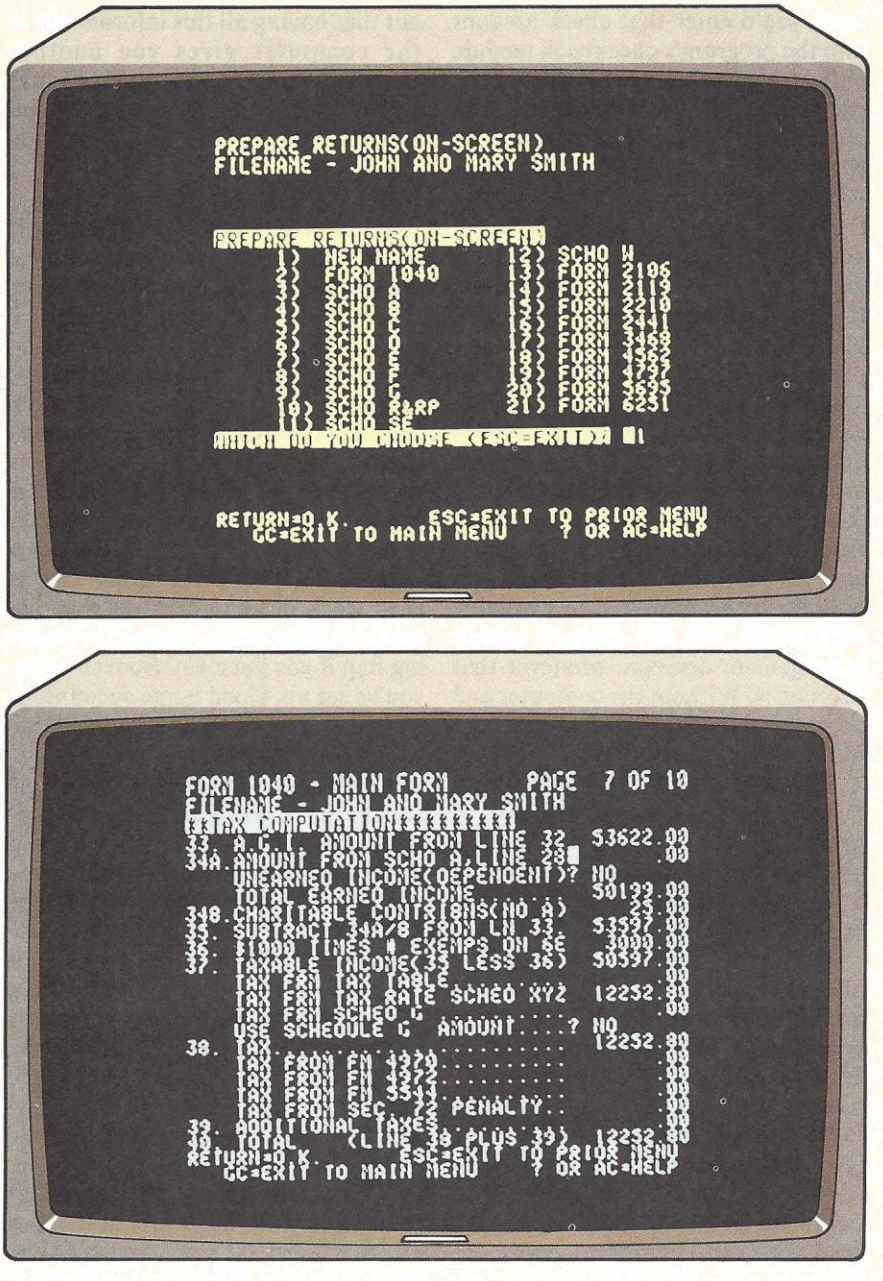
Expenses can be entered in the transactions module (top) of Home Accountant Plus. The amount of a check is entered in the checkbook module (bottom).

Prudent management

At this point we should enter a very important caveat. A computer's reports are only as good as the information you put into the machine in the first place. So the printed report of net worth will only be worth the paper it's printed on unless you've been very accurate in entering the value of your assets and liabilities. If you owe $40,000 on your house and you don't enter that value, then your reported net worth will be high by that amount. Or if you enter $80,000 instead of $40,000, then your reported net worth will be $40,000 too low. This sounds elementary, but it really isn't. It's easy to figure out how much you owe on the house—the bank tells you every month. But how about other assets? How much are they worth? Careful data collection and entry is a prerequisite for good management.

The data has to be analyzed after this first step, Chen says. Analysis determines your strengths and weaknesses and what you might be able to do to maximize the former and minimize the latter. After the analysis

A computer's reports are only as good as the information you put into the machine in the first place.



Tax Preparer's menu (top) displays all the federal tax forms the program handles. Form 1040 (bottom) is shown with the computer's calculation.

phase, says Chen, a client and a consultant from her firm agree upon the client's strengths and weaknesses and what flexibility the client has in dealing with them.

You may or may not be able to do that yourself. It will depend on the complexity of your financial situation. Some might be easy. Eddie Ngo, a San Diego-based certified financial planner, says he once had a client who, simply stated, was spending more money than he made. He had two high-priced cars and a fast-paced lifestyle—and no money left over. He wondered why. After the data was entered into the computer, it was easy to identify where this individual was spending too much money and begin to get the financial stituation in hand. "He was spending $2000 a year for gifts," Ngo says. "That was an area where we could do something." In other words, that was a weakness that could be dealt with and it couldn't be identified until all the data had been collected.

Chen says her next step is the development of goals and objectives. In setting these goals, her firm relies on the input of experts in various fields, not just one person's expertise. The goals have to take into account what the person's needs are and what he wants, his financial history coupled with his willingness and capacity to take risks. "Sometimes," she says, "we have to develop the motivation for the client to go after what the client needs. How does the client know? You don't go to a doctor and say, 'I have bronchitis, give me some antibiotics.' He diagnoses your illness and then prescribes the remedy. We have to do the same thing."

Indeed, since most people don't think about money management in a systematic way, they probably don't understand what their needs are. Lane of Schierloh and Lane points out that the needs change as people go through different stages of their life. Young single people have different needs, he says, than people who are newly married. When the kids get close to college age, then the needs will change again and when you near retirement, that milestone develops another set of needs. These needs can be translated into goals and this goal setting is another major requisite.

Napoleon's first Principle of War is the Principle of the Objective. It's the same thing in the field of management—management of money or anything else. Objectives or goals have to be set. You have to understand your objective. What kind of job do you want to have five years from now? What is our target cost for manu-

Developing an overall financial strategy requires a careful look at all the instruments you can use to attain your goals.

facturing Product X? What is our sales target for the next quarter? What financial position should I have attained five years from now? Ten years from now? When I retire?

Strategic planning

Once goals are set, the next step is the development of a plan to meet the goals that have been determined. Alan Feuerstein, a stock market consultant and financial analyst, refers to this stage as the overall strategy level of financial management. Developing an overall financial strategy, he says, requires a careful look at all the possible financial instruments you can use to attain the goals you have set. Says Chen, "It requires a professional team approach. We have a principle consultant who can work with others who are experts in particular fields."

Then, once the planning's done, management is required to ensure that goals have been or will be met. This is where your computer can come into play.

The packages that were mentioned before provide more capability than the development of a balance sheet. They provide a convenient way to track your assets and your liabilities, income and expenses. They can also supply alarms for situations that deviate from the established plan.

Staying the course

For example, The Home Accountant, which I personally use, has a transactions module that allows you to enter every expense that you incur during a month. As you enter the expense, whether it's from a checkbook, credit card or a cash outlay, the program asks you to enter an expense category for the expense. You have to define the categories when you're setting up your budget figures. For example, if you know that you have to pay $500 per month in food, then you'd define a budget category called Food and then you'd enter a month-end balance in this category of $500. When you write a check at the grocery store for food, you'd enter that check amount into the program's checkbook module with a category entry of Food and the program adds the amount of that check to the Food budget category. At the end of the month (or at any other time), you can get a printed report that shows the total expenses for all your budget categories. If you've budgeted over $500 for food and you see that you really spent $750, then you're alerted to the fact that your food expenses are getting out of hand. Now you can take corrective action. Such action might be to tighten the screws on food expenditures. It might be an increase in the amount allocated to food. It might be a shift of resources from some other expense category, such as clothing. Nevertheless, you now have the information available with which you can make a money management decision, whatever that decision is. Without the computer and its program, would you have had the information you needed?

Opinions vary. Why should you go to the expense, some people say, of getting a program that lets you track your income and expenses? You could do the same thing in a budget notebook, Feuerstein points out.

"You could do it all in a notebook, but then you wouldn't have the speed and utility that you have with a program," says Randy Ferguson, president of BPI. Ferguson is obviously biased, since his company publishes Personal Accounting, which does the income and expense tracking, in addition to the personal balance sheet. Ferguson notes, though, that your need for such a program really depends on your situation. "If all you have is salary income," he says, "and you fill out Form 1040 EZ, then you may not need such a thing. But if you have more—say, you and your wife both work, and you have investments and some rental property—then it becomes a valuable tool. It provides controls which you need as you work on your financial management." Ferguson and Chen both also point out that having all this information in the computer gives you another plus—instant statements of net worth, which can be useful, for instance, when applying for a bank loan.

What else can you use?

The two areas where a computer will be the most help in your money management effort are in the areas of record keeping and number crunching. The computer is, after all, nothing more than a tool to use in any endeavor. It can't make decisions for you, but it can provide the information you need to make the decision yourself. So far, we've seen that it can present the information you need to make intelligent strategic financial plans and it provides a handy way to keep track of and check on your income and expenses, raising the warning flag if you get away from the plan you've set up. Good home accounting programs provide these functions. But your computer can do more.

A particularly vexing facet of financial management—money management—is taxes. It isn't, they say, how much you make that's important. It's how much you keep. Chen of Chen Planning Consultants, Inc., says her firm looks at a client's potential tax liability as part of the organization phase of her services. Throughout the course of her services, she uses an IBM Personal Computer running 1-2-3 from Lotus Development for the number crunching required. Ngo, the financial planner, says he uses a tax planning package from Quadram Software called the Tax Strategist. "It's very fast and very quick," he says. "We can use the program to figure out a situation right in front of a client. Sometimes you just can't explain a tax situation without having the numbers on the computer. When a client sees the numbers, then he can understand. I had one professional client who was making $180,000 a year and paying $65,000 in taxes. I managed to cut his tax bill way down, simply by doing things that

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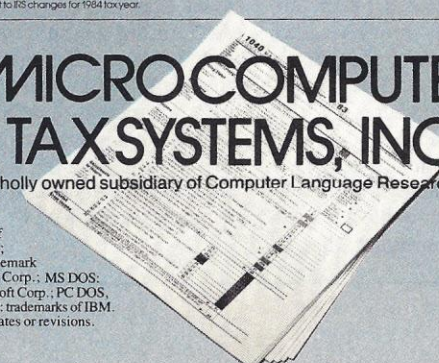

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A REAL-LIFE EXAMPLE

I didn't buy The Home Accountant to do financial planning. My requirement was much simpler than that. Despite the fact that I'm an electrical engineer, and therefore familiar with math and numbers, I couldn't keep my checkbook straight. It never reconciled, and I'd spend hours looking for the mistake(s) in addition and subtraction that caused the problem.

But once I had the program, I was amazed at how well it organized my financial activities. When you start the program, you're prompted to set up a full financial statement, entering your assets, liabilities, credit cards, income and expenses. This is all accomplished with the program's budget module, which prompts you to enter the name and type of budget category and then requires you to enter a month-end balance for each month of the calendar or fiscal year.

You have to know what you're doing, of course. I mean, you have to have the numbers. When you're entering the month-end numbers for the value of an appreciating asset, like your home, you have to have some idea of what the values are. Otherwise your financial statement, which is the result of all this, is useless.

At any rate, I went through all this activity, then went to the program's printed-reports module and printed out a personal balance sheet. It was quite revealing, because this was the first time that I'd been able to see that I actually was worth some money after all. Now it wasn't a lot and most of the assets weren't liquid (a home in New York is a big asset), but the balance was positive.

Now to tracking. The program has a transactions module and it's this module that you use for entering income and expenses. Entering transactions from the checkbook is a simple matter. You simply enter the amount that's written down in the check register. Cash expenditures proved to be another matter, though. How was I to keep track of small cash purchases? This is the rock on which many good intentions of tracking household expenditures founder.

We came up with what seems a good solution in this family. We try to get a receipt for everything. We have a small drawer in the kitchen where we deposit the receipts as they are collected. Once the drawer gets reasonably full, I collect the receipts and enter each transaction they represent into the computer, filling in the category as each transaction is entered. I was amazed to find out what we spend on food as a result of this tracking procedure. Other expenditures, like utilities and fuel oil weren't as surprising, since I'd always been invoiced for them by the company providing them. But for the first time I had a summary of where the money was going.

Using the program is simple, since it's all menu-driven. I just select the function, transactions for example, that I want and get a sub-menu with other choices. In the case of transactions, I can select checkbook, credit card or cash. Under checkbook, I can enter checks and deposits, search for a particular transaction, reconcile the bank statement or choose another checkbook (this program allows you five checkbooks; Dollars and Sense from Monogram allows 12) or return to the transactions menu. Entering checks and deposits is accomplished through a check-entry form on the screen. You have to be careful to enter the information correctly, because the program can only check you so far. It knows you have to enter numbers for an amount, for example, so it won't let you enter letters, but it doesn't know what the amount is. You have to get it right.

As I enter transactions the amount of the transaction is automatically posted to the proper income or expense category. At the end of the month, I print out an income and expense summary that compares how I did during the month with my budgeted figures. Then I can adjust either the expenditures or the expectations in the months that follow.

Knowing where the money goes is a definite advantage, because it allows us to set some goals. We now have a goal for a monthly savings amount that is possible, and we know it is, because we've seen it in black and white. We always know what our checkbook balance is, to the penny, because we aren't dependent on a fast subtraction at the grocery checkout counter anymore. And checkbook reconciling now is a matter of about 30 minutes. The program prompts me to enter the checks that have cleared the bank and then tells me if the checkbook reconciles. If it doesn't, it's always because I didn't enter something, like a service charge. It's not because of subtraction errors. That one feature was worth the cost of the program to me, but I got so much more besides.

Of particular benefit was the fact that I set up the accounts in the form I'd need for my tax return. Now I know at year end how much interest I've paid, how much in state and local taxes, how much for contributions, etc. I can even track sales tax paid, because this program, like others, allows split transactions—assigning portions of transactions to different expense and income categories. So I split every purchase on which we pay sales taxes into the purchase amount and the sales tax amount, thus keeping a running total of the sales tax I pay. At the end of the year, this can just be copied onto the tax form.

I should point out that there are things about The Home Accountant I don't like. For one thing it's slow—at least on my Apple. Disk access is slow, information entry is slow, due to the Apple's "garbage collection," and printing is slow. There's a graphic module that allows you to plot trends in income and expenses. It's slow, too. BPI's Personal Accounting is much faster. In addition, there seems to be no convenient way to change the value of an appreciating asset over the course of a year. Home Accountant doesn't automatically update an asset like your house; you have to go into the budget module and manually change it. Nevertheless, I found that this computer program has helped me get a handle on my financial situation. And I only spend about four hours a month doing it.

—David Gabel

are all legal and all in the tax code. I start with deductions that come about naturally. I view tax shelters as a last resort."

Ngo explains that tax shelters can be a double-edged sword. You have to look at the overall impact of the shelter to see if it makes sense. "There's no point in investing $10,000 to save $3000," he says.

Tax Strategist, according to Ngo, is quite simple to use. You simply enter figures that bear on your tax situation in columnar format. You can enter figures for a number of years or else you can enter different situations for one year, playing what-if on different tax strategies. The program shows your potential tax liability for the different scenarios you enter.

Of course, using this kind of a program isn't a last-minute, April 15 kind of thing. "June of the current year is about right," says Dick Lane. It can be later, he says, but in any case your tax planning has to happen in time that you can make decisions based on that planning before the tax form is due; in fact, tax reduction strategies have to be implemented before the end of the taxable year, except for investment in an Individual Retirement Account (IRA), which can happen up until April 15, under current tax law.

Are they any good?

One question that probably bothers you about using a tax planning package yourself is the quality of the tax planning software itself. After all, if, as a result of using a tax planner, you make a decision and wind up in front of an IRS auditor, you can't very well have the package explain what it did. So how good are such packages?

"It works very well," says Frederick Lang, speaking of the Tax Strategist. "It appears to be very simplistic, but the publisher apparently thought of everything." Lang is an inventor who needed some tax planning because, he says, he wound up with a large sum of money as the result of a favorable outcome with an invention of his called Langstrand, a coated, lubricated cable used in the construction industry for reinforcing concrete.

"I wanted to find out what my tax liability would be," he says, "and I wanted to do it myself. So I looked at the tax consequences of various investments. It was particularly important to me to know how much I could give away. I wanted to make several kinds of contributions and needed to know how much I could deduct." (Ngo notes that you can't pay zero taxes any more through tax strategies. There's now a provision for an alternate minimum tax of 20 per cent below which you can't fall.)

One question that probably bothers you about using a tax planning package is the quality of the software itself.

Lang says that the tax planning package allowed him to what-if his tax situation, looking at different alternatives for investing to determine what his best course of action was. "It's user-friendly," he reports. "It prompts you to enter the numbers and the results appear on the screen until you're ready to end a session and then you can get printed reports out." He says that, typically, he only had to enter one or two numbers to calculate the results of a new scenario.

The payoff? Lang says that when his accountant did the tax return the result came out very close to the figures that his program had predicted. That's why he says the publisher apparently thought of everything. Lang doesn't use a tax preparation package, by the way, because, he says, his accountant can probably do a tax return faster than the computer could in the first place.

Tax preparation software isn't a tool for financial management, but it's so closely related that it should be mentioned. Such software prompts you to enter the numbers that would go onto your tax form. Then it calculates things like your adjusted gross income, your total deductions and your tax, as well as the tax due, if applicable. Tax Preparer by Howardsoft, according to the company, does this in a logical, consistent manner. For example, as you're entering information on Form 1040 and you come to the space for deductions and enter I for itemize, the program automatically jumps to Schedule A and prompts for the amounts of deductions you have. After the schedule is finished, it takes the total number and puts it into the correct place on Form 1040. If you think you want a tax preparation package, make sure you get one that incorporates the federal forms you need, as well as state forms. Also, the publisher should provide yearly updates to account for changes in the tax laws.

Money management includes the gathering of information, the analysis of that information, goal setting and, finally, management of your assets on a day to day basis. A computer helps by letting you organize your data in the first place and presenting it in a logical manner so decisions can be made and by taking the burden of tiresome calculations off your shoulders. Part of the information gathering process, which we haven't talked about as yet, is the determination of your assets.

If your assets are cash and real property on which you're paying a mortgage, then value determination is simple. What if you have a stock portfolio? Or a bond portfolio? If that's the case, then some sort of portfolio package might be in order. BPI is introducing Personal Investing, which will do technical analysis of a portfolio for you, as well as tracking present

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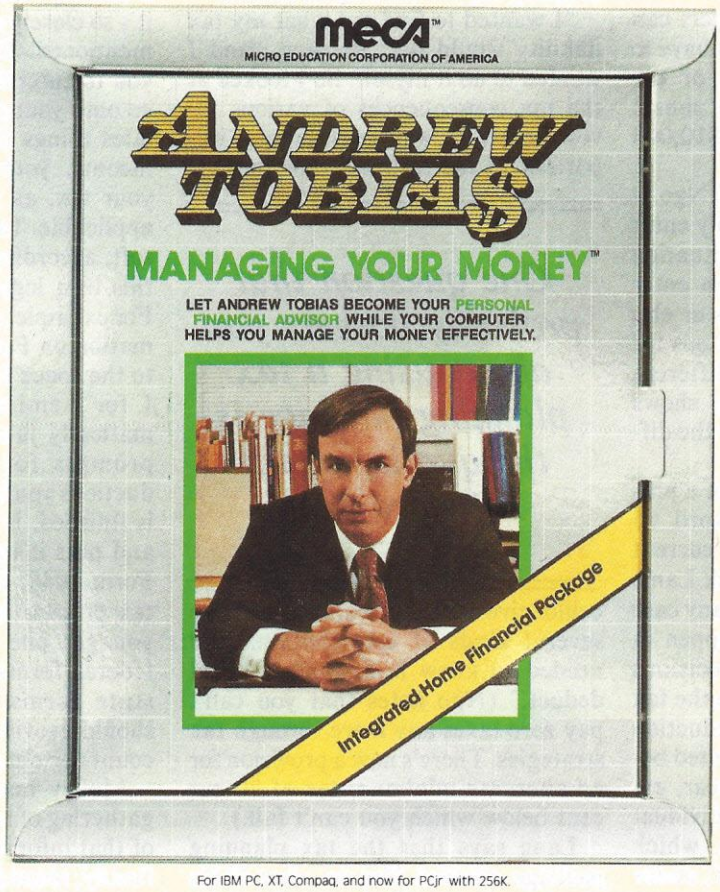

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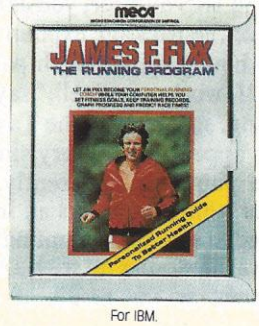

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A computer will act as the record-keeping and calculation tool you need to lift the burden and get on with management.

value of the portfolio. It will access the Dow Jones News/Retrieval Service data base for you to determine the value of securities you're holding and then Personal Accounting, also from BPI, can read the files that the investing package downloaded for inclusion in your asset structure.

There are a number of packages that let you evaluate potential investments in specific areas. Dow Jones publishes the Market Microscope and Market Analyzer for the stock market. Howardsoft has the Real Estate Analyzer for real property investments. All packages of this type are useful for information gathering. The information they provide may or may not be automatically enterable into a home accounting package. BPI's Ferguson thinks that's the way things will go, though, with all such packages from a company eventually talking to one another, so your stock information or bond information or real estate information will eventually be easily integrated into your accounting package.

Money management, as Lane says, is really asset management. Before you can start to do it properly, you have to know what your assets and liabilities are and which of your assets are liquid or could be made so. Then you have to understand what your flexibilities are—in other words, what possible actions you can take to impact your financial situation. Knowing where you are and what your options are, you then can begin to set goals that are realistic and formulate a plan to reach those goals. When the goals are determined, you then can track your performance against those goals and bring yourself on track. A computer will help you in the data gathering, presentation, record-keeping and tracking functions. If it's true and the experts all relate experiences that suggest it is, that most people don't really manage their money, then it's likely that they don't simply because the requisite record-keeping and calculations are too time-consuming to keep up with. A computer will act as the record-keeping and calculation tool you need to take the burden away and let you get on with the management. Depending on your situation, you might find you want an accounting package, a tax planner and a portfolio package to gather all your data and track all your activities.

But if you have a computer, do you need a financial planner? Lane says he thinks most people can probably figure out how to go about managing money for themselves, once they understand the fundamentals.

Still, whether you have a financial planner or not, the burden to keep the data on your financial life current will be your own. Your computer can really help.

TAXES ON THE COMPUTER

How do you do your taxes? Does your accountant do them? Then you either have to gather the data for him or else you have to provide all your receipts and pay stubs in a big envelope. The accountant then sorts it all out before preparing the return. If you do your own returns, then it's likely you spend two weeks just getting all the information together and then several nights with pencil, paper and calculator filling out the form. Why not use your computer?

A home accounting package will organize the records for you as you do your spending during the year. Then you can use a tax preparation package if you want. I don't do that. I use VisiCalc.

I actually have to fill out three major tax forms and several ancillary forms. I live in New York State but have income in New Jersey. So that means tax forms for the federal government, New York and New Jersey.

I put them all on one VisiCalc spreadsheet and tell the spreadsheet to pick up values from appropriate places and enter them. For example, total salary appears on all the forms. I only enter that number once, in my computer representation of Form 1040. The computer automatically picks that number up and puts it into the New Jersey form and the New York form. I do federal deductions and state deductions on the same spreadsheet, too, using the same kind of approach. That way, if I find another deduction, the computer automatically updates all the tax forms. I get the figures for all the deductions from my home accounting program, which keeps a running total of them throughout the year.

When it's time to fill out my tax forms, I just print out the whole worksheet. I have it organized so it all fits across an $8\frac{1}{2}''$ by $11''$ sheet of paper (several sheets, actually). Then I just transfer, by hand, the figures from the printout to the tax form. That's a laborious process, but it sure beats using a calculator. My only computational activity is looking up the tax in the tax tables. The tables are too big to enter into the worksheet, so I just enter that number—tax payable—by hand. If something changes enough to affect that number, then I have to look up the tax again. But all the other calculations, and there are a lot of them, are handled for me by the computer.

If I had a tax preparation program, it would look up the tax for me. And most of them will also print your tax form

There's another tax use I put VisiCalc to. Since I have income in addition to my salary, I have to make estimated tax payments. I built a model of the estimated tax forms on VisiCalc and this model automatically computes my estimated tax liability and current payment due (you have to make quarterly payments). Using this model, I always know what the upcoming tax payment will be. I use the Lookup function in this model to look up the amount of tax I should have to pay based on my total income and expected deductions. As something changes, I enter one number, and the entire model, including state taxes, recalculates. It beats pencil and paper.

—David Gabel

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When You Compute Outside the U.S.

How to plug in overseas—live or by phone

by Kevin McKean

Illustrations by Keith Bendis

Getting personal computers linked up between his home office and overseas branches, or representatives abroad, is a real opportunity for the U.S. businessman with international connections. As is the case with anything on the computing frontier, it is often beset with challenges.

Perhaps a majority of the problems have to do with communications: differing protocols, poor line quality, phones that break off unexpectedly or pepper a transmission with garbles.

All of which is *not* to say that international computing is impossible; on the contrary, it is done every day as more people and companies exploit the obvious opportunities. It is just that one must approach international computing much as one does international travel: with a spirit of adventure, a willingness to accept strange customs, and a sense of humor. "I realize this sounds like a cliche, but it's a different world out there," says Bruce Sullivan, a former product manager for the Entre Computer Centers chain and consultant on international computing. Adds David Morf of Monchik-Weber, a New York software and consulting firm: "The problems are all solvable, they're just more work—more you have to do before you can get down to business."

The biggest single source of trouble has always been and still remains trying to transfer data to other personal computers over phone lines, particularly via transatlantic link. The fundamental difficulty is that North America operates on different modem standards from the rest of the world. In the United States, Canada and Mexico, modems are governed by the Bell standard, while the rest of the world uses standards set by the International Telegraph and Telephone Consultative Committee (abbreviated CCITT in French), a United Nations-sponsored body based in Geneva.

In London, for example, Tom Gonser, executive director of the American Bar Association, tried unsuccessfully to make a local data transfer via a 300-baud modem that was based on the Bell 103 standard. That calls for sending and receiving data on frequencies of 1070, 1270, 2025 and 2225 cycles per second. But the CCITT V.21-standard modems used in Europe, although they also run at 300 baud, expect to send and receive only at frequencies of 980, 1180, 1650 and 1850 cycles per second. "The frequencies don't match up, and so they can't 'handshake,'" explains telecommunications expert Dale

Kevin McKean is a staff writer for Discover *magazine.*

Heatherington, co-founder of Hayes Microcomputer Products Inc., maker of the popular Hayes Smartmodem.

Chances for local overseas communication are a little better with 1200-baud modems, but for curious reasons. Under the Bell 212a standard, the "answering" modem (the one that answers the call) starts the handshaking procedure by sending a tone of 2225 cycles per second. The "originating" modem (the one that placed the call) is supposed to recognize this tone and respond by indicating it is ready. But under the V.22 standard of the CCITT, the answering modem first sends a 2100-cycle tone that a Bell-standard modem cannot understand. Then it sends a 2400-cycle tone that would not be any better, except that the modem also transmits a burst of data whose primary frequency is about 2250 cycles—close enough to the 2225 Bell-standard tone that some Bell modems will respond. Thus, two 1200-baud modems can occasionally be coaxed to talk to one another, Heatherington says, "but it is kind of a fluke when it works." To be on the

TAKING COMPUTERS OVERSEAS: A ROCKY ROAD

As executive director of the American Bar Association, Tom Gonser has a special interest in international communications. Not only does the powerful 300,000-member lawyers organization need to maintain ties with equivalent groups in other countries, but, under Gonser's leadership, the ABA is building its own international mail and data link – ABANET. "I'm a confirmed, dedicated electronic mail user," says Gonser, who estimates that he sends 80 percent of his correspondence that way. Thus, the first time he took a portable computer to London he made sure it was one with a built-in, acoustic-coupled modem so that he could stay in touch electronically.

Like many well-laid plans in international communications, this one went awry. "It turns out that the Brits either have bigger hands or longer ears or something," Gonser says, "because when you try to put the slightly longer London phone into a rigid acoustic coupler, it won't fit."

Gonser's experience, though frustrating, was hardly unusual. Even experienced personal computer users can easily run afoul of the many hazards that lie in wait when they try to carry their machines overseas or set them up in a foreign office. The technical challenges range from picking the right computer and running it on the proper power supply to maintaining its operations under sometimes adverse conditions. There is also a thicket of bureaucratic hassles: export licenses, customs law, import duty and so forth.

Some of the more stringent foreign regulations may, for example, make it *illegal* to use American-made equipment in some countries where the equipment itself works just fine.

The first problem

The first problem, of course, is picking the right computer to carry. For occasional business travelers, the computer they already own will suffice. But if a computer is being bought for extensive use overseas, it should be compatible with, or adaptable to, the appropriate languages. Manufacturers who sell internationally usually have made some provision for this: Kaypro, for example, sells adaptor kits for German, French and Spanish (eight more languages are under development) that include a foreign-language keyboard and character-generator chip for $395.

One of the other fundamental problems in choosing a computer for foreign use is making sure it will run on the foreign power supply. "I never cease to be amazed by the number of travelers in Europe who are totally dismayed when their electric razors won't plug into the wall," says Warren McKenzie, a Dallas telephone executive, "and the same thing is true in spades for computers." Some machines convert from the United States-standard 110 volts to the European 220 volts simply by changing a cable connection inside and substituting a fuse. (The IBM Portable Personal Computer already contains circuitry for European operation without a converter.) But one must also read the fine print to make sure the computer can change from the American 60 cycle per second frequency to the 50 cycles common in Europe. "Some computers have their disk drive speed controlled by the line frequency. If you take it to Europe and give it 50 cycles, it slows down and you can't read any of your disks," warns Amal Chaudhuri of Monchik-Weber.

For a computer that is not adaptable, you can buy a power converter. "You need a real big one," cautions Phil Revzin, an American newspaper correspond-

The more people who use computers while crossing national borders, the easier it will become to do so.

safe side, travelers who need to communicate with foreign modems should carry a CCITT-standard device. (The 300-baud V.21 standard is the most common. As the demand for international communication grows, some companies are introducing modems that operate on *both* standards. Anderson Jacobsen, for instance, plans to bring out a 1200-baud modem that will switch between Bell 212a and V.22 to sell for about $500 by the end of the year, says product planner Karl Shimada.)

To communicate back the United States, of course, a traveler would need the ordinary Bell-standard modem. But this could present technical problems: The 2025 and 2225 cycle-per-second frequencies of a 300-baud U.S. modem fall into the "forbidden band" reserved by the CITT for telephone company signaling. If the local foreign phone company happens not to use that band, there will be no problem. But if it does, says Heatherington, then some difficulties may spring up. "The modem may simply not work," he says, "or it may cause all sorts of bizarre and

ent in London, "because the first ones you buy are always cheap and they blow out." Chaudhuri offers the following rule of thumb: Buy a power converter that is rated to handle about 150 percent of the wattage the computer needs. (For a computer that is not rated in watts, calculate the figure by multiplying its line voltage times its rating in amps—both usually listed on the back of the machine.)

But for anyone who plans to use the computer principally overseas, most experts agree with Bruce Sullivan, a consultant on international computing, that it is better to buy it there. "You may have to pay a few dollars more, but that's fine because if you're counting on a machine for business you will need to be sure it is getting serviced."

Once the machine is selected, the traveler can turn his attention to the fascinating question of whether he needs documents to carry it. The key issue here, says the Department of Commerce's office of export administration, is one of ownership. "If you personally own the computer and have a receipt to prove it, you can take it abroad as baggage. But if your company bought the machine for you, you need an export license," says a department spokesman in Washington, D.C. The good news is that an export license does not cost anything; it just requires a lot of paperwork. The bad news is that it takes four to six weeks to get (the department is trying to speed this up—to three to four weeks). Also, using an export license can make a traveler liable for paying *import duty* when he enters the foreign country. In most European countries, this duty is 5.7 percent of the computer's value (plus a "value-added tax" ranging up to 25 percent of the duty).

And you can forget about obtaining an export license to take a computer into Communist bloc countries. Even the ABA's Tom Gonser could not negotiate one for presenting a TRS-80 Model 100 as a gift to his counterpart in Moscow. "One of the folks in our Washington office literally jumped through hoops trying to get the various approvals," Gonser says. The reason is that computers—even little ones—are considered a potential threat to U.S. security if they fall into Communist hands.

Interestingly, exceptions can be made for travelers to the People's Republic of China, where Gonser recently traveled freely with his Radio Shack and where Project Hope is training hospital administrators using computers donated by Kaypro, according to the company's international grants director, Tom Peifer.

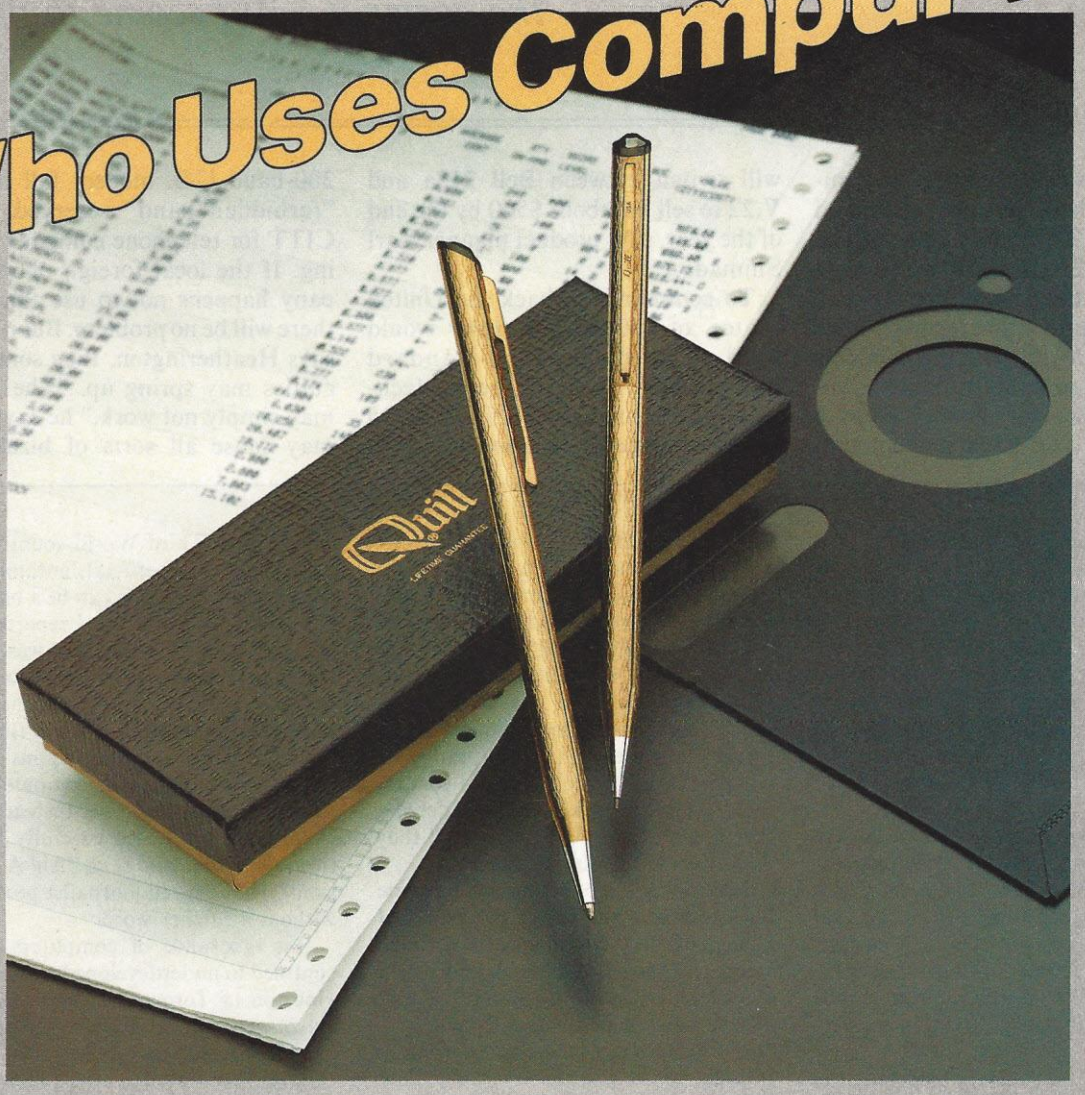
For a computer that is only going to Europe, and only temporarily, one can avoid import duties by obtaining a *carnet*—in effect, a temporary import license for the 10 member nations of the European Economic Community. At $75 or so, a *carnet* is often much cheaper than paying duty and value-added taxes. But it is no guarantee against headaches. Ed Porrazzo of ADI American once turned up with a *carnet* for his Osborne at German customs and still had to post an $800 bond against the possiblity that he might sell the machine. When Porrazzo left the country, he was in such a rush that he failed to stop into customs and retrieve his bond—and lost it forever. And, a *carnet* is no help outside Europe. To carry a computer into India, even temporarily, one has to post a bond equal to 165 to 235 percent of the machine's value, according to the Indian Consulate.

Travelers to Third World countries report that customs officials' unfamiliarity with electronics goods can be a blessing. One *Wall Street Journal* reporter tells the story of a colleague who was carrying a portable computer into Iran. That government is not noted for its charity to foreign reporters who want to file their stories directly, and the customs officer might have stopped the computer if he had recognized it as one. Instead, after examining the device carefully he noticed the screen and said, "Ah! A television!" The relieved journalist proceeded without a further word.

But ignorance of computers is not confined to underdeveloped nations. Pat Houston, a Toronto correspondent for *BusinessWeek*, remembers the customs expediter (a person who helps get things through) who wanted an explanation of the "madam" listed in the waybill for a shipment of telecommunications equipment. Canadian customs officers, by the way, have a reputation for being quite tough on computer shipments when the papers are not in order. Houston ran afoul of this when he ordered some U.S. software and a mail clerk in New York inadvertently sent it via intracompany mail. "Customs found the software and they thought we were trying to smuggle it in," says Houston. "A revenue clerk came to the office for an investigation. It took months to get it out."

The only sure way to avoid problems of customs and duties is not to worry about them—and be born lucky. That's the method used by Hyperion's European sales manager, Trevor Duplock: "I carry my computer all around Europe but it looks more like a gym bag than a computer, and I've never been asked for any documentation," says Duplick. "I guess they haven't caught on to me yet."

Who Uses CompuPro?



The Quill Company of Providence, Rhode Island, manufactures 200 different precision writing instruments. Each pen or pencil requires up to 16 parts. For a given part, the quantity on hand may hit six figures. To monitor this massive inventory, Quill relies on a **CompuPro** system.

Another fact: In 1982, Quill had fewer than 1,000 active accounts. Now the customer list is almost 3,000 names long and still growing fast. But Quill president John N. Bedford isn't worried about outgrowing his **CompuPro**. "We know it's a system that can be expanded, and grow along with our business," he says.

Quill's administrative staff has doubled during the past year, but the workload has swelled fivefold. Besides inventory and invoicing, the computer helps with accounting, sales reports, cost analyses, mailing lists and credit checks.

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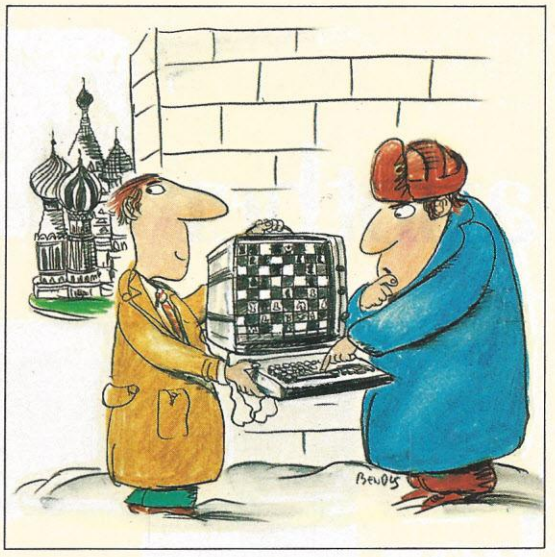
erratic behavior—such as fouling up the billing or causing the telephone to hang up."

A further wrinkle for using Bell-standard modems abroad is that it is often illegal. The reason is that telephones in most countries are tightly controlled by the local government's postal-telephone-telegraph monopoly (PTT), and many PTTs forbid the use of any modem other than a government-approved device. Some, like the German Bundespost, even require that modems be made by or leased from the government. (If this seems medieval, remember that less than a decade ago we Americans had no options beyond renting a telephone from Bell.) Travelers who are just passing through Europe can probably afford to ignore these laws; who, after all, is going to catch them? But businessmen who operate regularly from an office must be more careful. If PTT inspectors in some countries find out about illegal modem use, they are apt to yank out the phones!

Even if the technical and legal problems of modem compatibility can be solved, data calls to distant lands can be a problem simply because of poor line quality. The *Boston Globe*'s bureau in Tokyo transmits back to Boston directly with the 300-baud modem built into a communications-enabled portable computer. But when the line is bad, the *Globe*'s correspondent has to run down to the Reuters office and use its wires instead. From India, says Monchik-Weber's Amal Chaudhuri, "The lines are so noisy that the modems can't key in on each other, and sending over the phone is a waste of time."

In some countries—Switzerland is one—the phone company may put an audible beep on the line to time calls, as Harry Newton discovered last year when he tried to transmit from the Telecom 83 convention in Geneva to his office in New York. Each time



there was a beep, Newton's modem would lose its carrier tone. "I called the phone company and screamed bloody murder," says Newton, publisher of *Teleconnect* magazine. "They dialed me up on their own circuit without a beep from Zurich, then gave me a circuit to America. By then I had three operators—one in Geneva, one in Zurich and one in New York—working on it. All three dropped off the line, and I transmitted data like I was next door.

"They didn't charge me," adds the Australian-born Newton, "but it was only because I was a member of the press attending the world's largest telecommunications trade show—and because I was furious." For others less privileged or less irate, the cost of direct-dialing may be prohibitive. Ed Porrazzo of ADI America, the Sacramento, Calif., affiliate of a West German software house that markets the Aladdin data base management program popular in Europe, remembers running up a $400 phone bill in a single day when his company had a crash program that involved sending software documentation back and forth to West Germany.

Companies like banks and large corporations that need permanent, reliable links overseas often resort to leasing a line to their foreign branches. But this can be enormously expensive—thousands of dollars a month. A more economical alternative is to use packet-switching networks—data-carrying companies, like Telenet, Tymnet and Uninet—that have links to similar services abroad. The first step is to establish an account with the appropriate PTT in the country where a traveler is headed—which can be a daunting task because the PTTs are so big and bureaucratic.

"If you call the German Budespost and ask about packet-switching," says one American who has tried it, "there's a good chance that they'll have absolutely no idea what you're talking about." One easy way to find the right person to contact is to use GTE Telenet's free listing of overseas contacts. (Telenet reaches 350 cities in 53 foreign countries.) To see this listing, call the local Telenet number and type "Mail" at the "@" prompt. Then use "Intl/Associates" as user and name and "INTL" as password. The Telenet services lists the name, address, phone and Telex of the proper PTT authority in each country, and also the rates and types of services which are being offered.

Signing on

Armed with a PTT account, the traveler simply signs onto the local network and reaches Telenet by typing its international access code—3110—followed by the access number of the particular Telenet subscriber he wants to communicate with. Transmission delays are negligible—a few seconds at most—and so the traveler can carry on an electronic conversation. There are few line problems because it only requires a local phone call. And rates are typically lower than long distance: To send data from Chicago to Santiago, Chile, for instance, costs $12 an hour connect

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charge on Telenet (plus a $12 added charge for every 64,000 characters of data) versus $45 to $75 an hour direct-dial.

Packet-switching networks allow you to circumvent the inconvenience of time zone differences by using an electronic mail service such as GTE's Telemail or ITT's Dialcom. These can have a hefty minimum monthly fee ($500 for Telemail, $100 for Dialcom) but the fee usually covers a large number of mailboxes under a single corporate account. It is a good idea to make sure that the electronic mail service can also send and receive from telex, since this snail's-paced, 66-word a minute service (the forerunner for modern data communications) remains the network of choice in much of the world.

As a final option, one can always use mail or international courier. This is certainly the cheapest, and possibly the most reliable, way to send international data. Just make sure that the two computers are compatible, that the diskette is well wrapped or packed in a protective box or case, and that the sender makes a copy in case it goes astray. (Some automated postal handing equipment in Europe, as well as in the United States, involves magnetized components; but as yet no significantly large-scale diskette disturbances have been reported.)

Pressure to improve

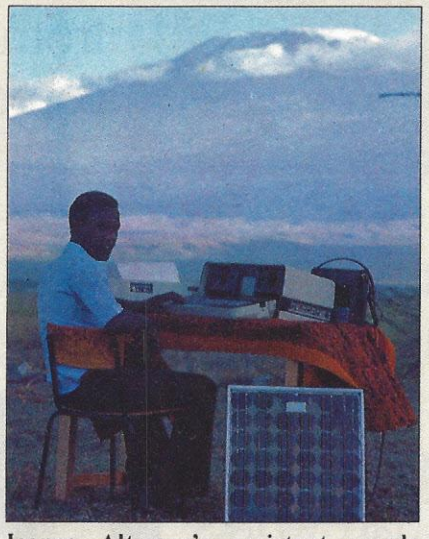
Although this article outlines many of the hazards of international computing, it is not intended to turn away those who want to try it. In fact, the more people who use computers while crossing national borders, the easier it will become to do so. This is especially true in the field of telecommunications, as Frederic Gasquet, a Grid vice-president based in Paris, explains: "The pressure is getting higher on the local telephone organizations in Europe from foreign manufacturers like Apple, Commodore, Hewlett-Packard and Grid to make things easier. I think the door is beginning to open." But reform must also take place at home, says Heatherington of Hayes. He expects the breakup of the Bell system to put increasing pressure on AT&T to bring North American standards in line with those overseas. As he puts it: "The communications network is no longer limited to the United States. It's a worldwide network, and you have to be compatible with the rest of the world." The day is coming, he and others hope, when computing around the world will no longer be fraught with challenging obstacles.

COMPUTER IN KENYA: BABOONS IN A DATA BASE

When the now-defunct Osborne I computer first came out, a lot of people complained that it was too hard to read the small 7″ screen. Not Jeanne Altmann. The reason? This University of Chicago biologist was not plugging her Osborne into a wall outlet, but into a solar-charged battery in an adobe hut in Kenya's Amboseli National Park. "If it had a large screen," she explains, "it would draw more power. So we think you can see the small screen just fine." The story illustrates one of the key points of choosing a computer for overseas use: It's got to fit the setting and the local needs.

Those needs can be quite demanding at times. And Altmann is an expert at taking computers into environmentally hostile situations, having carried two Osbornes to her camp near the base of Mount Kilimanjaro—cradling one of them on her lap so it would not be damaged by the bouncy Landrover ride.

The computers are a great advantage to these scientists, who are engaged in a 10-year study of baboon behavior in the wild. For one thing, during observations they record data on devices resembling hand-held computers to create a taped record of such significant behavioral events as grooming, mating, fighting, eating and nursing among the animals. These records used to have to be sent back to Chicago for analysis. Now, they can be entered into the Osborne at the end of each day and the machine creates an immediate report. It can, for example, consider the current and past records of fighting and grooming to update the ever-shifting pattern of dominance in a particular tribe of baboons.



Photograph by J. Altmann

Jeanne Altmann's assistant speeds Baboon Behavior Data to the Osborne.

But electricity is at a premium. Even under the tropical sun, it takes a good eight-hour charge to operate the computer for two hours. Disk use drains power and must be kept to a minimum. (Altmann is experimenting with a RAM drive system.) And computing sessions sometimes come to an unexpected halt if a dust storm blows up.

Nevertheless, the Osborne has proved hardy enough to withstand these travails, and is simple enough to be fixed in the field (Altmann says the simpler a machine, the better). To send data back to the United States, Altmann's colleagues simply make a copy of the diskette, wrap it in cardboard and drop it in the mail. "It takes the same time as any thing else from Kenya, which is highly variable," she says. "But we haven't lost any disks in the mail—at least not yet."

—K.M.

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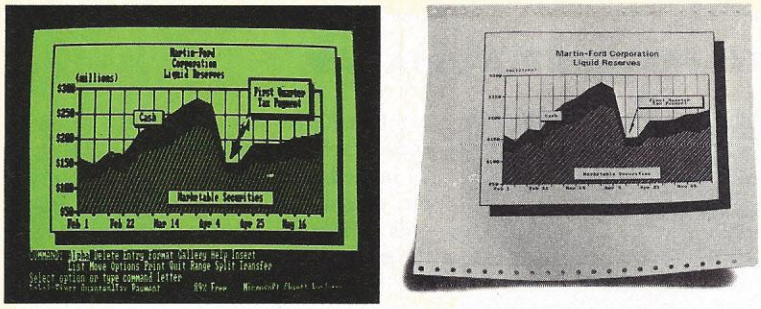

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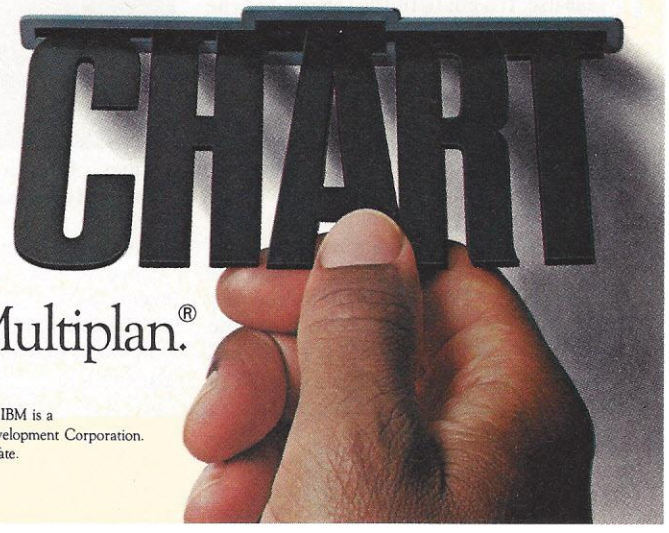

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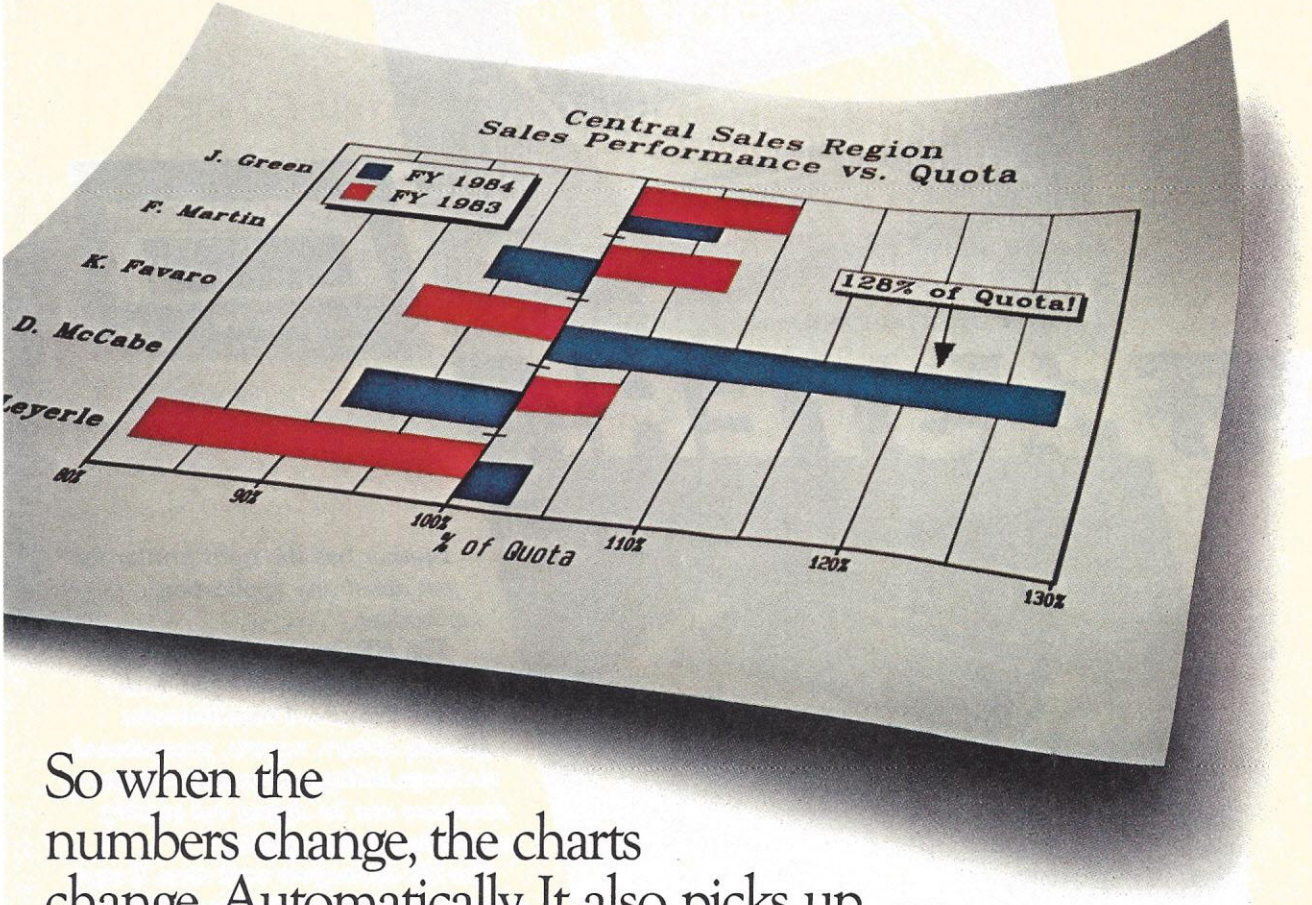

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CIRCLE 89

The Mainframe Connection

The welcome isn't exactly warm, but more personal computers are venturing into the land of the giants

by David Gabel, Contributing Editor

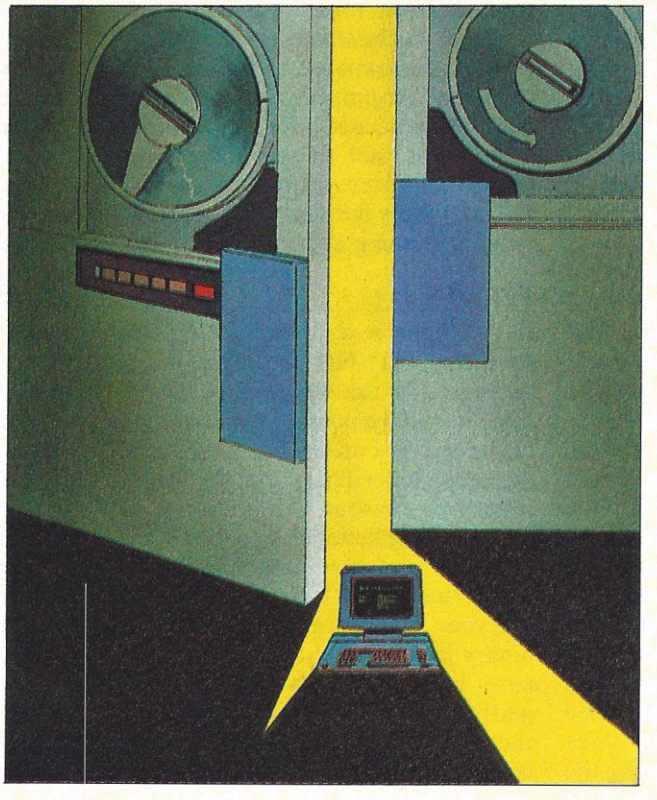


Illustration by Andrea Baruffi

It's the darling buzzword of a lot of people—the "micro-mainframe link." It's captured the imagination of those who reason that if using a personal computer with maybe 128k of main memory and 10 Mbytes of hard disk storage is good, why not get access to a mainframe? After all, a big mainframe has as much as 8Mbytes or even more of main storage, and hard disks for those guys can run into the gigabytes. (A gigabyte, or Gbyte, is 10 to the ninth power bytes, while a megabyte, or Mbyte, is 10 to the sixth power bytes—the difference is a thousand to one.)

Well, it's tempting all right. But you have to ask yourself exactly why it's so tempting. Is it because of all the mass storage that's available? Probably not, because with new Winchester disks coming on-line with 40Mbytes of storage, that's all the storage anyone's likely to need for personal computing for a while, provided it's organized and maintained properly. So mass storage isn't the driving need to connect to a mainframe—or even a minicomputer, for that matter.

Is it for information transfer? Is it the ability to load corporate data into a personal computer where a manager or section chief or whomever can have his own personal copy? Yes, that's part of it. There's another dimension, too. If there were a network of personal computers in the corporation, all of which had some access to the corporate mainframe, think how that could speed up inter-office communications. No more sending paper memos to the mailroom where they disappear for two days before reappearing at the office just down the hall. You could just send a memo to your mainframe with a distribution list and then all the addressees would check their mailboxes at their earliest convenience.

No longer does every computer in the corporation have to be connected to the mainframe, using up valuable computer time with relatively slow communications tasks. Just a few of them would need that connection and the others could be connected to the mainframe-link nodes with local-area networks (LANs). In effect, every personal computer would be connected into the company's information network. They could all share information with one another that they would have no other practical way of sharing, or that it would otherwise be prohibitively slow to share. Now *there's* a reason to connect to a mainframe—communications.

Now that we have a reason, we have to understand that the opportunity is also fraught with peril as well. The

A data processing department will be looking to make computing resources available to ordinary people.

mainframe guys, the data processing types, have been accused of all sorts of parochial thinking when it comes to their computers. That may be a justifiable accusation, but there's a reason for that parochial thinking: These guys have a lot at stake. They are aware of the things that go wrong, and the magnitude of the errors, even when there are *no* outside connections to big, mainframe computers.

Horror stories

Let me give you an example from real life. I used to be one of those mainframe guys, although the mainframe I was working with was a peanut by today's standards. I was data processing operations manager for an U.S. Army division when this particular incident occurred. We had a program we ran that took care of inventory and ordering all the spare parts we needed. The organization we supported had about 18,000 people in it and each of them had an individual weapon—a rifle or pistol—and each in turn had about five common repair parts that had to be stocked and reordered. That's 900,000 spare parts just for individual weapons. We had only minimal time-sharing capability and no communications at all. No one but the computer guys could ever get into the machine. Nevertheless, something happened in the repair/parts system. The computer aborted a job and the operator didn't do the right thing when he restarted. We lost some 1200 records of repair/parts orders. We didn't know that the error had been made and didn't catch it for three days. We had to correct it, running the system for three days to get back to where we should have been.

So you can imagine the nightmares data processing people have when they think about people who know nothing about large computers getting communications links into their big computer and all its important corporate data.

There are solutions to all the problems these people can think up. One is to let personal computer users link with the mainframe to only read data. Access to write into files is restricted to qualified persons. There's another solution, though, that permits more communication: Simply set up user file areas and let personal computers access those file areas only, with both read and write access. Then, assuming everything works properly, there won't be a problem with sensitive files being overwritten.

Both these solutions assume that the host computer has excess capacity that's waiting to be tapped—which may not be the case at all. There's a computerized form of Parkinson's Law that can be stated as: "Computer work always expands to fill installed capacity." Arguments over degree of mainframe access, in many companies, might well remain moot until more computer resources are installed, simply because the large computer is running at capacity.

But what-if . . .

If you have a data processing department that has the interests of managers in the company at heart, then it will be looking for ways to make more computing resources available to ordinary people for at least two reasons. First, doing so makes people better able to solve their problems and that makes the company run better—that's good for everyone, theoretically. Second, if ordinary information users in the company have their own capability for getting the information they can use, then it makes the job of the data processing department easier in the long run. In the short run it doesn't, because new systems have to be set up to handle the information/dissemination task. But in the long run, things will work better.

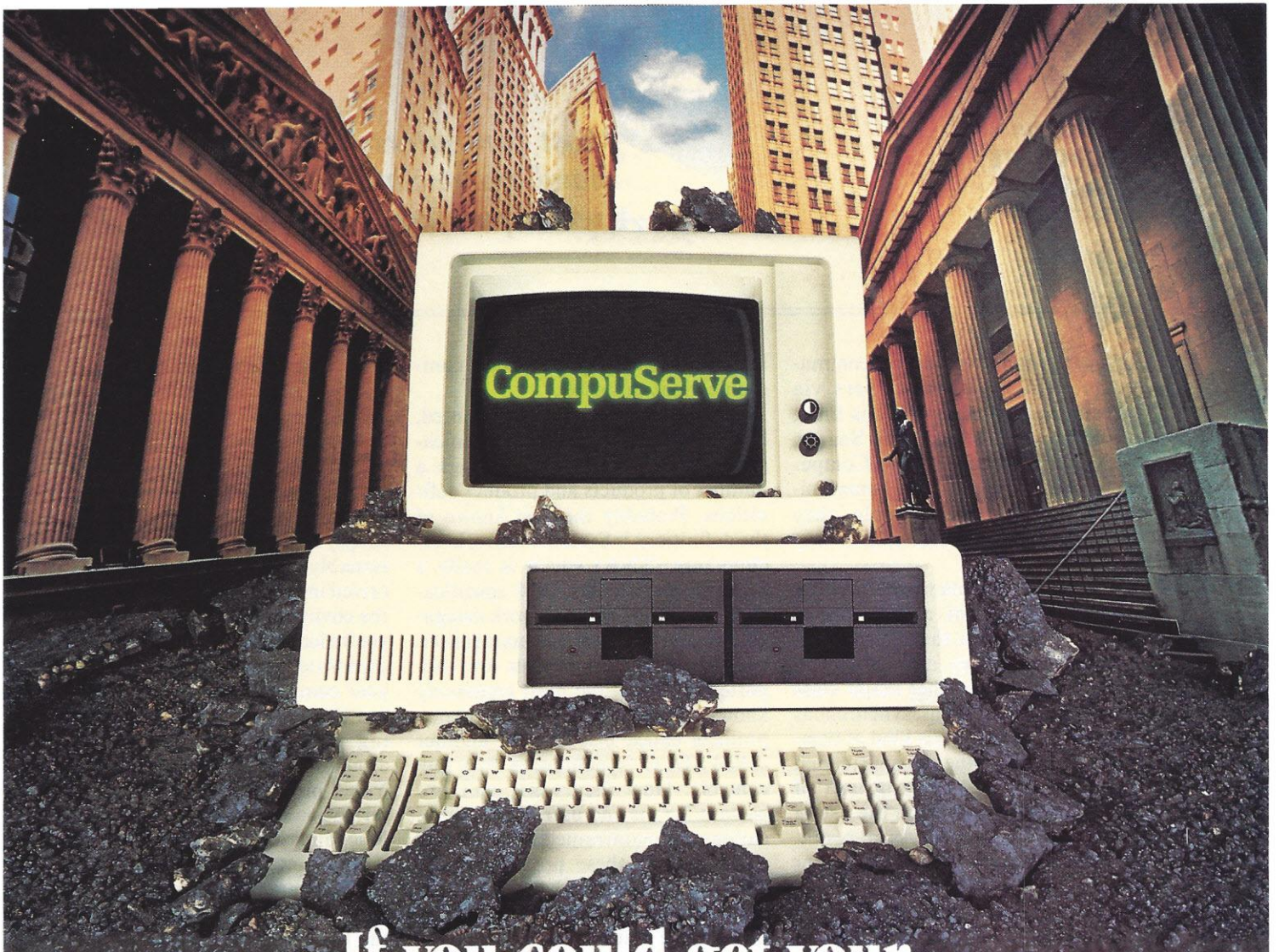
But if you can get a connection to a large computer, what will it entail?

There are two ways, essentially, to communicate with a big computer. The first, and the easiest to understand, is asynchronous communications. That's the kind of communications that happens between personal computers. Asynchronous communications is something like human verbal communications. When two people talk, neither of them knows when the other will start or stop. We have evolved societal protocols over the ages so we can determine when information transmission has stopped in human communications so the other party can start transmitting. One person stops talking and the other waits for a small amount of time and then starts. There are also intonation codes we use to tell others that our transmission is about to end. But there is no set time period for us to transmit or receive. We do one for a while, then the other and so forth. This necessitates that communication is a little slower than it might otherwise be because we have to be sure we know who's doing what.

Asynchronous data communications work the same way. A receiving computer doesn't know when a transmitting computer will send, so it has to be ready. And the transmitter has to tell the receiving computer that it's finished with a "word" so the receiver can get ready to take the next one. These signals are sent according to asynchronous protocols—rules for communicating with no synchronization between receiver and transmitter.

Asynchronous communications, because of its unpredictability, is always slower than synchronous communications. But it can be implemented fairly easily and fairly inexpensively. The only thing you need to get a personal computer talking to a large computer is an asynchronous communications port on both machines and software to support the communications on both ends. The actual physical link can be made through telephone lines or through a direct connection from the small computer to the big one.

This is the way that communications is implemented with the public data bases. The Dow Jones News/



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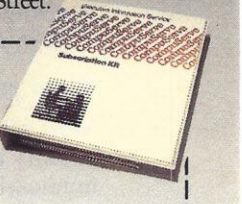

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CIRCLE 51

Most computers have the capability to handle asynchronous communications. A serial port can be added if they don't.

Retrieval Service computers communicate with their subscribers via asynchronous communications links, as do the computers of The Source, Dialog Information Services, CompuServe, etc. Asynchronous communications are relatively simple, they work fairly reliably and they're easy to understand.

But mainframe managers may not wish to implement asynchronous communications on their large computers because they are slow when compared with the other major class of data communications, synchronous communications. In this kind of communications, both the transmitter and the receiver are kept apprised of what's happening through the use of synchronizing signals. As a result, communications can happen faster and you can jam more information into the channel, allowing for things like error detection and correction in the data stream. This kind of capability is vital if you're going to be sending sensitive data—financial statements or product specifications that have to be correct. So because of the inherent speed and error-handling capabilities of synchronous communications, the central computer in a company—the one you think might give you an edge if you hook up to it—may not support asynchronous communications and you might have to opt for the other kind in one form or another.

What you'll need

Most personal computers have the capability to handle asynchronous communications. If they don't have the serial communications port, which can handle asynchronous communications, built-in then such a communications device can be added. But even the computers that have asynchronous communications capabilities don't, normally, have synchronous capability. That capability will have to be added. It's usually done through the addition of a circuit card in an I/O port of a computer and the purchase of software that emulates long-established synchronous communications protocols.

These protocols are implemented, in the IBM mainframe communications world, for instance, through a number of products and product definitions. Probably the best known of the definitions is System Network Architecture (SNA) which is really a series of proprietary IBM specifications around which a network designer can build a data communications network. Several protocols are supported by SNA, the most commonly known of which are a transmission protocol called bisynch and another called SDLC (synchronous data link control). How they work isn't important for the end user of communications to a mainframe, but it is useful to know that these protocols exist. IBM has a number of hardware products that support these protocols and perhaps the best known of these is the 3270 family of communications terminals (including workstations and personal computers). These are terminals that fit right into an SNA kind of environment. A mainframe that uses SDLC will look for something on the other end that acts like a product in the 3270 family.

Boards or boxes

Today there is no need to run out and buy a 3270-emulating terminal to talk to a mainframe computer. Several manufacturers, among them Digital Communications Associates, (Norcross, Ga.) AST Research, (Irvine, Calif.), Winterhalter, Inc., (Ann Arbor, Mich.) and Techland Systems (New York, N.Y.) offer plug-in boards or stand-alone boxes that can get an IBM Personal Computer talking like a 3270 family communications terminal. These companies can speak at great length about the communications services their products provide.

The point is that it isn't quite so simple when you get into this realm. You don't just run out and get a modem and toss it into the computer, boot a terminal-emulator program and you're in business. It has to be more carefully thought out than that.

Having the connection established is one thing. Doing something with the data you get is quite another. If you're talking about using a central resource simply for communications, then presumably data would get sent and received in formats that are congenial to the environments on both ends. But if you're looking for the ability to get the corporate sales forecast down from your company's big computer so you can use the data to develop a marketing plan (or is it the other way around?) you may have a problem. You'd presumably like to get the information in a format that lends itself to loading into your Lotus 1-2-3 program or into SuperCalc 3.

Mainframe files are stored in formats that the programs running on the big computer can use. They are not, in all probability, stored in the way that a spreadsheet wants to see them. If that's the case, then you need a "file translator" in addition to the hardware to connect to the computer and the software to control the communications link. These products are becoming available now as well. Very often they are the result of collaboration between a mainframe software publisher and a publisher of personal computer software.

Such is the case with VisiAnswer and Answer/DB, marketed by Informatics, but developed in cooperation with VisiCorp, and Peachlink from MSA, which is the parent company of Peachtree Software. These linking software packages find the information a personal computer user is looking for on a mainframe computer and format it to load into the appropriate target user program on a personal computer. They are specific to the end application, however, and are not general purpose file conversion programs. More software vendors are getting on the bandwagon, but the universal file-transfer program is still, by all accounts, a long way off.

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CIRCLE 55

Taking Your Computer Abroad

If you have questions dealing with hardware, software, or applicaitons, Personal Computing *will answer them in this monthly column. Please send your 'need-to-knows' to: Answers,* Personal Computing, *10 Mulholland Drive, Hasbrouck Heights, New Jersey 07604.*

Q: Can I use a portable computer with a modem in a country which has a different telephone system than the United States?

A: In order to use a modem in a foreign country, you must first overcome two hurdles—one technical and the other legal—says Patricia Bishop of Hayes Microcomputer Products, Inc., in Norcross, Ga., a major manufacturer of modems.

First of all, Bishop says, the modem you use has to be compatible with the telephone system in the foreign country. Technically, many countries, especially those in Europe, require that the modem meet standards set by the Consultative Committee on International Telephone and Telegraph (CCITT), and some countries have other technical requirements based on the way their telephone systems work.

To solve the second problem, the modem manufacturer must meet certain filing requirements to gain legal approval for modem use in a particular country. "We have to go country by country since each country has a different approach to their telephone utility," explains Bishop. "It's a matter of filing the right forms with the right agencies, and the process can be slow," she adds.

This barrier of red tape can create some interesting situations, such as a country allowing a modem to be sold, but not used. At this writing, Hayes modems have cleared both barriers in the United States and its territories, Canada, Hong Kong and Saudi Arabia. The company is hoping to clear some final legal barriers in European countries soon.

For more details, see "Making The International Connection" on page 147 in this issue.

Q: What are the specific differences between BASIC and GW BASIC?

A: GW BASIC from Microsoft Corp. of Bellevue, Wash., grew out of the original IBM BASICA, an advanced version of BASIC for the IBM Personal Computer. Greg Fowler, a technician in Microsoft's product support group, points out that GW BASIC is not sold on the retail level, but is licensed to OEMs (original equipment manufacturers) who want to customize it for their particular machine. (Incidentally, the "GW" stands for the highly technical term "Gee Whiz.")

One such company is Panasonic Corp., based in Secaucus, New Jersey. Mike Harman, an engineer at Panasonic, explains that Microsoft licenses GW BASIC to his company for use in its personal computer. Harman explains that in order for the computer to be disk compatible with MS-DOS, the GW BASIC has to be renamed BASICA, or the system won't recognize it. So, after manufacturers customize Microsoft's GW BASIC and incorporate it into their systems, they rename it BASICA.

Fowler says that the most immediate difference between BASIC and GW BASIC is GW's graphics capability. GW BASIC also offers full-screen editing, and most customized versions have built-in drivers for printers, screens, the serial port, and for the use of specialized peripherals such as touch screens and light pens. "GW BASIC is essentially BASIC with a bunch of hardware-specific enhancements," says Fowler.

Most machines that run MS-DOS, such as the Compaq and TI Professional, run a customized version of Microsoft's GW BASIC.

Q: What are the most popular data base applications in business environments?

A: MicroPro International of San Rafael, Calif., found out the answer to that question themselves recently by conducting a survey to explore the uses of InfoStar, the company's data base management system software.

According to MicroPro's Judy McClean, the most common uses cited were: file and record maintenance, mailing list maintenance, job cost systems, customer lists, inventory management, prospect-tracking, order entry and billing systems. McClean also noted some more unusual uses for InfoStar such as its use as a travelog for a commercial aviation outfit, its utilization by a chemical research business for researching and indexing, and use by a Nashville music fan club for tracking the music charts.

ANSWERS

Q: What is the best way for a busy New York CPA like myself to learn to use Lotus 1-2-3—tutorial disks, classes or books?

A: Explore all the possibilities. Browse through books at a computer store. Ask for demonstrations of tutorials. Investigate courses at local community colleges, and ask others in your profession what their experience has been.

If you prefer classroom instruction tailored to your profession, there is a service in your area that is especially tailored to CPAs called New Focus Computer Centers, which offers a course on Lotus 1-2-3. New Focus Computer Centers, Inc., is located at 219 E. 44th St. in New York City 10017, and their number is (212) 599-2211.

Q: In your March issue, there was a letter from a woman whose son had cerebral palsy and was unable to do two-key commands; you recommended a touch pad as an alternative to using the keyboard. Is there any way the computer itself can be altered to make it easier for the handicapped to use?

A: Yes there is. Carol Sweet, a reader in Webster, N.Y., writes that she and her husband bought a Franklin computer and had the dealer install a toggle switch that, when in a certain position, "locks" the control key. It works in the same way a "caps lock" key works. After the control key sequence has been typed, the user flips off the toggle switch, and continues working.

"Of course the installation of the switch violates the manufacturer's warranty," Sweet says, "but a good dealer will continue to honor the terms of the warranty because you have paid him to make the adaptation."

Sweet's dealer, the Tronix Computer Store in Rochester, N.Y., can make the same toggle switch installation (which includes added circuitry) for anyone who sends in his computer.

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The adaptation will work on "just about any computer," costs around $40, and will be completed within 24 hours of the store's receipt of computer. Interested parties should call Dave Tilcher or Burt Hineline, (716) 621-5320, before sending in their equipment. Tronix Computer Store, Inc., is located at Street of Shoppes, 1600 Ridge Road West, Rochester, NY 14615.

Q: I have read that the Dvorak typewriter layout makes for a much more efficient keyboard. Can you please tell me where I can buy such a keyboard and if there is a program to learn to type on it?

A: You won't need to purchase a new keyboard—you can switch over to Dvorak on the keyboard you have, just by using software to make the transition. But first, a quick explanation of the Dvorak layout.

This keyboard is said to be anywhere from 20 to 60 percent more efficient than the standard keyboard. All vowel keys are grouped together on the "home row" of the left hand; the most commonly used consonants are on the right hand's "home row."

The Dvorak keyboard (as opposed to the standard "Qwerty" layout, named for the first six letters on the left side of most typewriters) has been around for years, though its popularity is recent. This is mainly because a computer produces characters electronically rather than mechanically as a typewriter does. It's relatively simple on the computer to switch from one keyboard layout to another, and back again. One wouldn't even need a change in hardware.

By buying software that "translates" your keystrokes into the Dvorak version, you can trick your computer into thinking you have a Dvorak keyboard. Such software often comes with some type of key overlays to show you what letter each key represents. Or, if your keyboard allows it, you can actually pop off the keys and switch them around.

Using the "translating" software is as simple as booting up the program and inserting your applications package. As for learning to type in "Dvorak-ese": A company called Arrays, Inc./Continental Software makes a program called "Learn to Type" ($39.95) that teaches both the Dvorak keyboard and the standard Qwerty keyboard. This one-disk program allows you to choose which of the two key placements you want to work with, then offers about 25 lessons in finger control.

The program also contains a game, and it will tell you how many words you're typing per minute, on which keys you are slow and on which you are fast. It allows you to switch back and forth between the two keyboards easily, and, for teachers, it has the ability to set up practice paragraphs that emphasize certain problem areas, and to track the progress of 30 people.

You can find the program at your retail store, or order directly from the company's order desk at (213) 410-3977. The program works on Apple IIe, IIc, and Macintosh; IBM Personal Computer and PCjr; Atari; and Commodore 64.

Another manufacturer, Seasoned Systems Inc., of Chapel Hill, N.C., makes Dvorak software for the IBM Personal Computer and compatibles. Called SureStroke/Dvorak, the program not only features lessons that teach the Dvorak keyboard, but also the "translating" software you'll need to trick your computer into thinking you have a Dvorak keyboard. "It's the complete package to implement the Dvorak keyboard on your personal computer and learn to use it," says Dick Helwig of Seasoned Systems. "It translates the keyboard from Qwerty to Dvorak. And it's an on-line training aid."

The training part of the program is adaptive, Helwig says, which means it looks at the strengths and weaknesses of each person using the Dvorak keyboard and alters how it presents the lessons based on that person's abilities. "No two people get the same training," he explains. "And it keeps a total history of everything you've done for the life of the time you've used the program. It picks up where you've left off, presenting the optimal sequences to get your total fluency up." He says one can expect to be typing from 20 to 30 words per minute after spending only 20 minutes a day for about a week and a half on the SureStroke/Dvorak package.

Also included with the package are transfer letters which are placed on top of your keys to remind you of the new layout, and an audio "self-hypnosis" tape which puts you in a framework for learning, Helwig says. The program is available for $49.95 plus $3.95 for shipping and handling, by calling (800) 334-5531, or (919) 967-5818.

The Dvorak International Federation, headed by Virginia Russell, can provide more information on the availability of Dvorak-related products. Call Russell at (802) 247-6020, or write to her at P.O. Box 128, Brandon, VT 05733.

Q: I decided on an IBM Personal Computer for software reasons, but I'm disappointed by the IBM color monitor's resolution. I've been told the problem is not the monitor but the IBM color card. Is there any way to upgrade the IBM color monitor?

A: Yes. There are quite a few third-party color card manufacturers who purport that their cards improve on IBM's resolution. The cost is a bit steep, though—most run in the $600 to $800 range.

One such product from Quadram Corporation of Norcross, Ga., is the QuadColor video card. Functionally equivalent to IBM's cards, the color card has some extra features. It allows color bit-mapped graphics with 16 colors on the screen at one time. Upgraded QuadColor cards allow for im-

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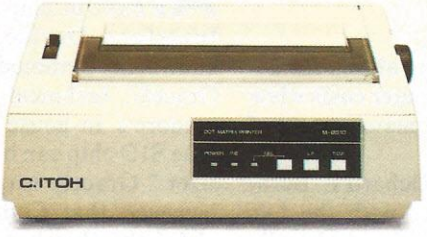

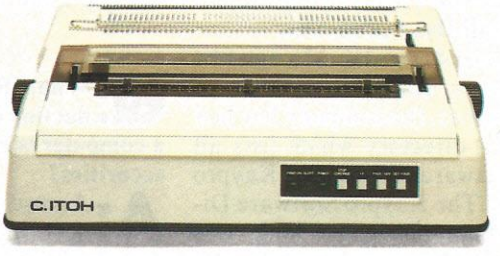

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Other manufacturers you may want to look into are Plantronics/Frederick Electronics of Frederick, Md., who make a high-resolution color graphics adapter called Colorplus, and Tecmar, Inc. of Cleveland, Ohio, makers of a multifunction board called Graphics Master.

Q: I recently bought a Kaypro II, partially because of the "thousands" of programs available in CP/M 2.2. Now I need to know where I can find all these programs.

A: According to Margaret Phanes, Kaypro's director of public relations, the company has just published a directory which lists all kinds of software that runs on Kaypro computers. The Kaypro Software Directory, about 600 pages long, was sent to all Kaypro dealers; ask your dealer to let you browse through his copy until you find the programs you're interested in. The dealer can then order the programs for you, or you contact the software manufacturers directly.

You might also consider a local users group as another source. These groups, which generally meet weekly or monthly, are comprised of people who live in the same geographical area and own the same type of computer. Your fellow Kaypro users are likely to be one of the best sources you'll find for recommending good software packages.

Q: On page 216 of your June issue, I read that Western Union's EasyLink System costs "about $40 a month." Yet I've heard recently that there is no charge for the service, only the charge for each message you send. Could you clarify this, please?

A: What you heard is correct; our information was dated. As of April 2, according to Bill Heinemann of Western Union, there is no fee or monthly charge for EasyLink. All you are charged for is the cost of each message sent. The only requirement for use of the service is that you do a minimum of $25 per month after the first 90 days of use. If you do less, you are billed for $25 worth.

Western Union did away with registration and monthly fees because "we want more subscribers," says Heinemann, and he points out that Western Union "provides telegrams, cablegrams, mailgrams, computerized letters, E-COMM letters, and domestic and international telexes."

Q: What IRS ruling allows the deduction of computer costs when a computer is used for management of securities?

A: According to Richard L. Bernacchi, a lawyer with the Los Angeles law firm of Irell and Manella who specializes in the legal, business and tax problems of the data processing industry, the IRS code does not specifically address this issue. "There is no specific ruling that I am aware of for the use of a computer for securities management," says Bernacchi, "nor has there been any change in the IRS code since 1983 that I know of that might apply to this use."

However, Bernacchi claims such a use applies as a deduction under Section 212 of the 1984 IRS code. Here, if computer use is part of a business expense, it can be deducted. It appears that home use for the management of a personal portfolio would also apply. According to Bernacchi, "If the purpose is for production of income, I believe there is still a basis for deduction."

Section 212 of the IRS code, titled "Expenses for Production of Income," reads:

> In the case of an individual, there shall be allowed as a deduction all the ordinary and necessary expenses paid or incurred during the taxable year:
>
> 1) for the production or collection of income,
> 2) for the management, conservation, or maintenance of property held for the production of income; or,
> 3) in connection with the determination, collection, or refund of any tax.

Q: I remember reading that the Commodore 64 is an excellent home computer for music. Is this so, and if so, why?

A: The Commodore 64 has a built-in chip called the Sound Interface Device, affectionately known at Commodore as SID. Jim Gracely, technical editor for Commodore's in-house magazines, says "the SID chip can be used as a synthesizer." Gracely is quick to point out, however, that Commodore does not claim the chip has the quality of an actual synthesizer and he says musicians find SID is "a little noisier and not as precise," as an actual synthesizer.

SID also allows a choice of four wave forms: triangle, saw-tooth, variable pulse, and noise. In addition, the filter is programmable, and special effects are possible because one oscillator can affect the tone produced by another. For an approximation of sound mixing, external input, which can come in through the video port, goes through the same programmable filter as internally generated sound. "It's like having an external voice being acted upon or affected the same as an internal voice," says Gracely.

The overall range of oscillation with SID is 0 to 4 KHz, which "gives you about 8 octaves of notes available for each of the three voices," says Gracely.

All of SID's properties can be accessed through machine language or BASIC, and there is now commercial software which takes advantage of the SID chip, most notably MusiCalc from Waveform.

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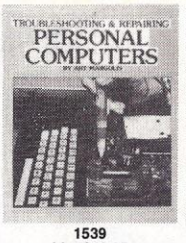

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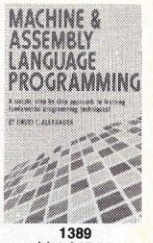

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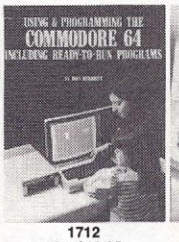

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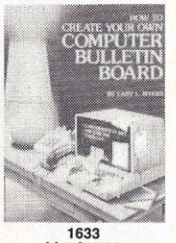

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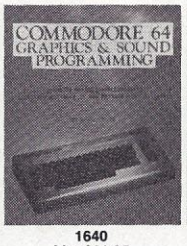

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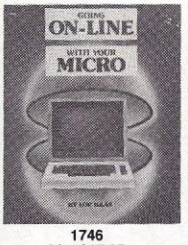

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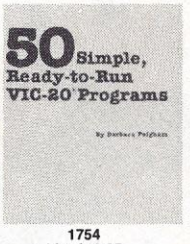

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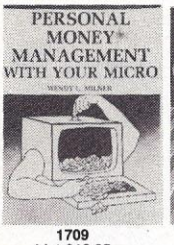

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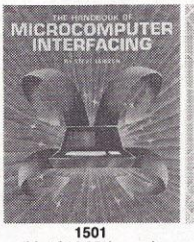

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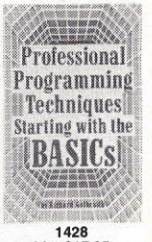

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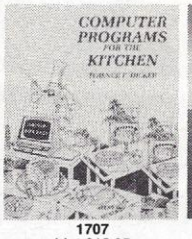

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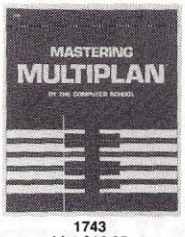

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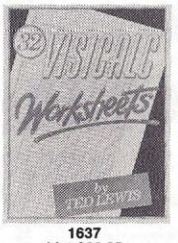

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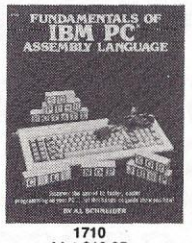

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Kids And Computers

INTELLIGENT SCHOOLHOUSE
DALE PETERSON, ED.
RESTON PUBLISHING CO., INC.
RESTON, VA
321 pp., $14.95

Kids and computers. To many people, these are two of the great mysteries of life. It seems only natural, then, that the two should come to be so inexplicably intertwined in a subject of concern to students, parents, teachers, and other professionals as well. The concern comes with the fact that although kids just love computers, computers seem to have become indispensable in practically every aspect of modern society except the schools, where they're used to provide mere variations on drill-and-practice exercises—making the machine little more than a very expensive deck of flash cards.

To give you some insight into understanding the impact of the situation, *Intelligent Schoolhouse* gives you a collection of 41 essays by people in various professions with one thing in common—they have all had experience with educational uses of computers. The authors include a government planner (Andrew Zucker), founders of public-access computer centers (Ramon Zamora, Annie Fox), a developmental psychologist (Mary Humphrey), science educators (Carl Berger, Kathleen Fisher), a professional games player and writer (Bernie DeKoven), and many others. In addition, there are essays by students.

As for how parents are affected by the technology, Peterson says they're goaded by a combination of guilt and technolust into buying home computers for their offspring, only to end up with children who can shoot down aliens for hours (possibly days, if bedtime and school didn't intervene) at a stretch, but who ignore those expensive "educational" drill programs. Are these children the fighter pilots of the future President Reagan talked about? Are they wasting their youth on an activity more destructive to creative thought than pinball or pool was to their elders? Or are they really learning to make rapid decisions based on a staggering number of variables, recognizing subtle patterns that make winning play possible, and otherwise developing complex conceptual skills?

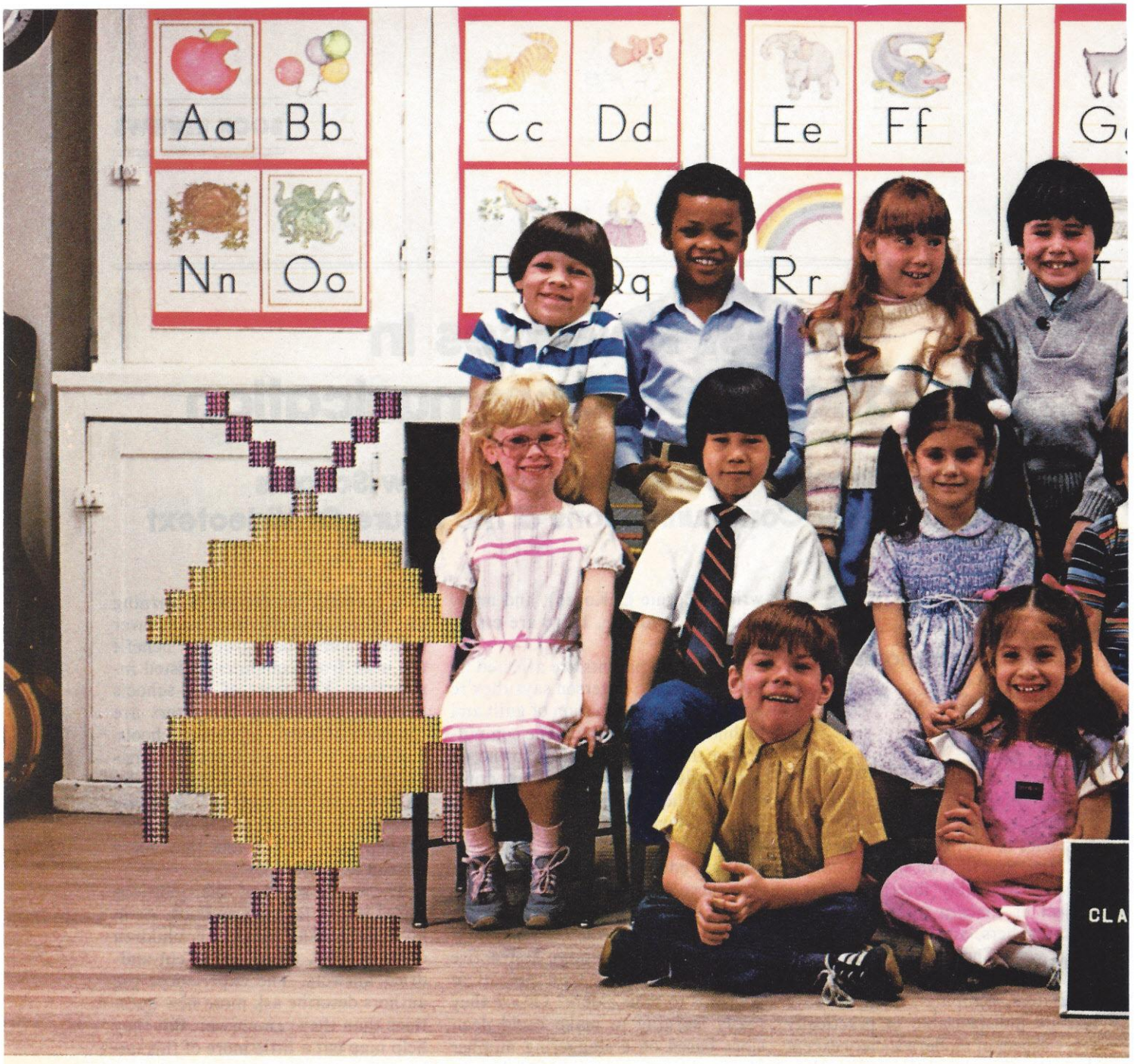
In the book, Peterson quotes a concerned parent who asks, "Why are we so fascinated with technology in general? We always thought nuclear power was wonderful, and now we can't get rid of it."

Are computers in education another such ill-fated experiment that will embarrass us in years to come? Are they just a fad? Are they mind-numbing for growing children, offering only repetitive games, many violent in nature? Do they promote the idea that every problem in the world is easily computable.

In addition, it has been shown that slow learners, children with learning disabilities, and children from lower socioeconomic backgrounds benefit the most from computer-assisted instruction. Yet most of the schools that are purchasing computers are the more affluent, suburban schools, and even at these schools, the machines are earmarked for use by "advanced" students. Are we creating a greater social and educational gap with a tool that could instead help close it?

These are some of the questions raised in this fascinating book. As in all areas dealing with either children or computers, there are no cut-and-dried answers. The experiences the authors describe ask more new questions than they can answer. But they help map out a little more of this unknown terrain and suggest possible future directions. After all, as the book says, "The responsibility for change in education lies not with the computer, and not with the people who buy more computers, but with the people who decide how computers are used."

Whatever the world of the future will be like, computers are sure to be in it. More people are buying computers; more schools are buying computers. "The phenomenon marks either another pointless educational fad, an abandonment of human values in favor of technological craziness, or a marvelous revolution with great promise." Or maybe a little of all three . . . only the future will tell.
—*Orlan Cannon*



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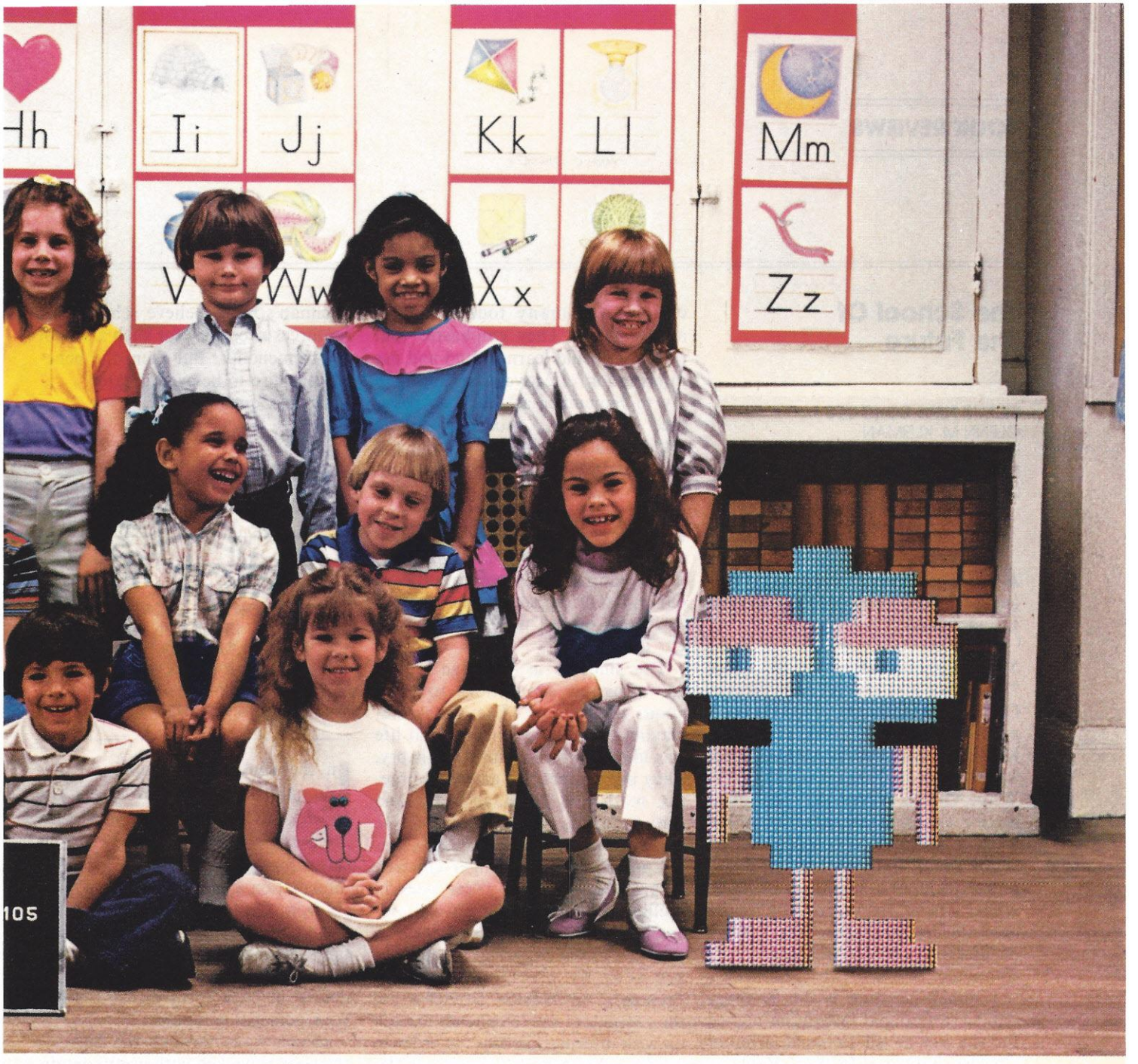

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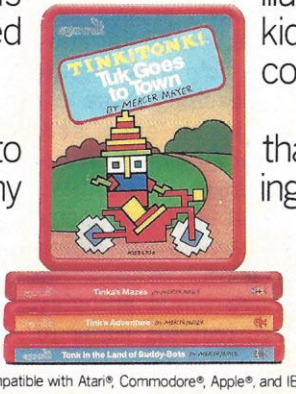

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GLENN M. KLEIMAN
RESTON PUBLISHING COMPANY, INC.
RESTON, VA
220 pp., $14.95

A sign in a classroom at Babbage School reads: "I Hear and I Forget. I See and I Remember. I Do and I Understand."

This quote from *Brave New Schools* reminded me of the quote "Ignorance is strength," from George Orwell's *1984*, but the resemblance is purely formal. It *is* 1984, and Glenn Kleiman's vision of the technological future is very different from Orwell's. While Orwell feared that the information and physical resources of the world might be tightly controlled by a small group and used to maintain power, Kleiman imagines a world where these resources are made available to everyone. The vehicle of distribution is, of course, the computer.

Kleiman's setting is the Babbage School, a fictional institution named for the not at all fictional inventor Charles Babbage. In 1835, Babbage designed the Analytical Engine, a device widely considered to be the world's first programmable machine. Without having to invent new uses for computers in the future, Kleiman creates a school that has at its disposal all the computer technology and resources that exist today. All the equipment and software mentioned in the book are already in use in educational programs. The idea of putting it all in one place makes for a pleasant fantasy. It also provides one of the clearest descriptions of what computers can do in the classroom and how they can fit into the total educational picture.

The teachers at Babbage School have a different approach to education than many today. As the author says, "They emphasize that students should learn to find and use information effectively, rather than try to remember as much as possible." My father, a professor, used to tell me that knowing how to find and use resources was much more important than memorizing facts and figures. And what better tool is there than the computer for organizing resources? While other tools and machines let us extend the capabilities of our bodies or our senses, the computer lets us extend the capabilities of our minds.

The students at Babbage School use computer simulations to learn about ecosystems. They use role-playing simulations to learn what life was like at different times in history. They use competitive games to practice math and language skills, and they analyze some arcade-style games to learn principles of physics.

Computers drill younger children in pronunciation and older ones in spelling. The children use word processing programs for their writing projects, and some write letters that are sent by electronic mail to "pen-pals" in Mexico. Students use the computers and telephones to hook up with information bases in order to gather references for papers or debates. And they release their artistic urges by creating pictures using the graphics capabilities of the Logo language. Physcially handicapped children at the school have special equipment that makes the computers available to them, as well.

Computers definitely present new possibilities in the realm of education. "They can help make traditional means of teaching more effective, and they can open new approaches to teaching and learning . . . ," says Kleiman. "In addition to being educational tools, computers are themselves a topic about which students need to learn."

Charles Babbage would probably be proud to have lent his name to Kleiman's make-believe school. The resources necessary for such a school are tremendous. But then, the benefits promise to be even greater.
—*Orlan Cannon*

For Information Addicts Only

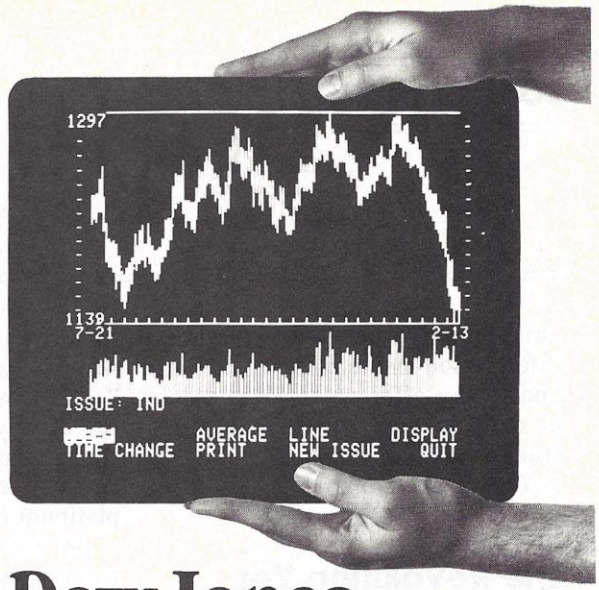
MICROCOMPUTER COMMUNICATIONS: A WINDOW ON THE WORLD
BARBARA E. McMULLEN AND JOHN F. McMULLEN
JOHN WILEY & SONS, INC.
NEW YORK, NY
154 pp., $14.95

In the book *Microcomputer Communications: A Window On the World*, Barbara and John McMullen are positively gushing in their enthusiasm for videotex. Clearly a pair of information addicts who need a daily fix from CompuServe or some bulletin board system, these two consultants have done their own information retrieval so you can get the details in book form rather than at your personal computer.

If you wade through the puffery, the book is packed with useful details on how to communicate using a modem and which services are supplying the really interesting information. About two-thirds of the book is appendices, including phone numbers and examples of the kinds of bulletin boards or services available. For example, you can, say the McMullens, use these remote services to find terrific investments, a higher-paying position or even a compatible mate.

If you're a novice in the personal computer communications world, this book is a good place to go for information. In addition, it's easy to read. And although novices will pick up a lot of pointers, more experienced communications users will find the book a useful reference tool. The

2 Reasons Investors Are Getting "Street" Smart.



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PC-9

*The chart in this ad (and, incidently, in most Apple ads for the IIc) is a Price and Volume bar chart that shows the performance of the Dow Jones Average over a six-month period. You can also construct Moving Averages and Trend Lines.

authors readily admit, however, that information on telephone numbers and service offerings tends to go out of date quickly, which is certainly true for parts of this book.
—*Jeffrey Bairstow*

The Revolution Yet To Come

THE FUTURE OF VIDEOTEXT
EFREM SIGEL
PRENTICE-HALL, INC.
ENGLEWOOD CLIFFS, NJ
195 pp., $9.95

For several years, videotex (the preferred spelling of the Videotex Industry Association) has been a solution in search of a problem. Efrem Sigel's previous book on the subject, *Videotext—The Coming Revolution in Home/Office Information Retrieval* (reviewed in *Personal Computing*, April 1982), foresaw a glorious future for the then embryonic videotex business. Unfortunately, that revolution has yet to happen, as Sigel's latest book makes.

In case you've missed reading or hearing the hype about videotex, it's simply a way of displaying words, numbers and pictures on a TV screen at the touch of a button. The technology to do that exists today. In fact, a few people are using videotex systems every day, but for most of us, videotex has all the impact of a newspaper tossed on the lawn in a rainstorm. In short, videotex is a technology-driven business waiting for the market—people who are willing to pay real money for the service—to catch up.

Sigel, the author of a lively electronic publishing newsletter, is still optimistic about the future of videotex, but even he has mellowed in his attitude in light of the experiences of such big-time companies as Knight-Ridder Newspapers, Time, Inc., CBS and AT&T. These firms have dipped their toes into the chilly videotex waters. As Sigel poignantly notes: ". . . it is hard to imagine any videotex display that will get 20 million Americans to switch off 'Monday Night Football' in order to check platinum futures. . . ." Quite so.

But if videotex is as wonderful as its proponents claim, why hasn't it caught on? Sigel's comment about professional football on TV is the key: Watching a bunch of men create mayhem over a piece of inflated leather stimulates the juices—it's entertaining. Ogling a data base on a terminal is a yawner unless you happen to be a farmer whose entire farm hangs on the day's futures prices. Checking a data base and staying informed, in this case, gives real meaning to the expression "to bet the farm."

On the other hand, the editors of *Newsweek* may feel that they, too, are helping people stay informed. But in addition, there's a large slice of entertainment in printed reading matter. If videotex is to succeed against magazines, newspapers and television, it must also entertain. So far it hasn't.

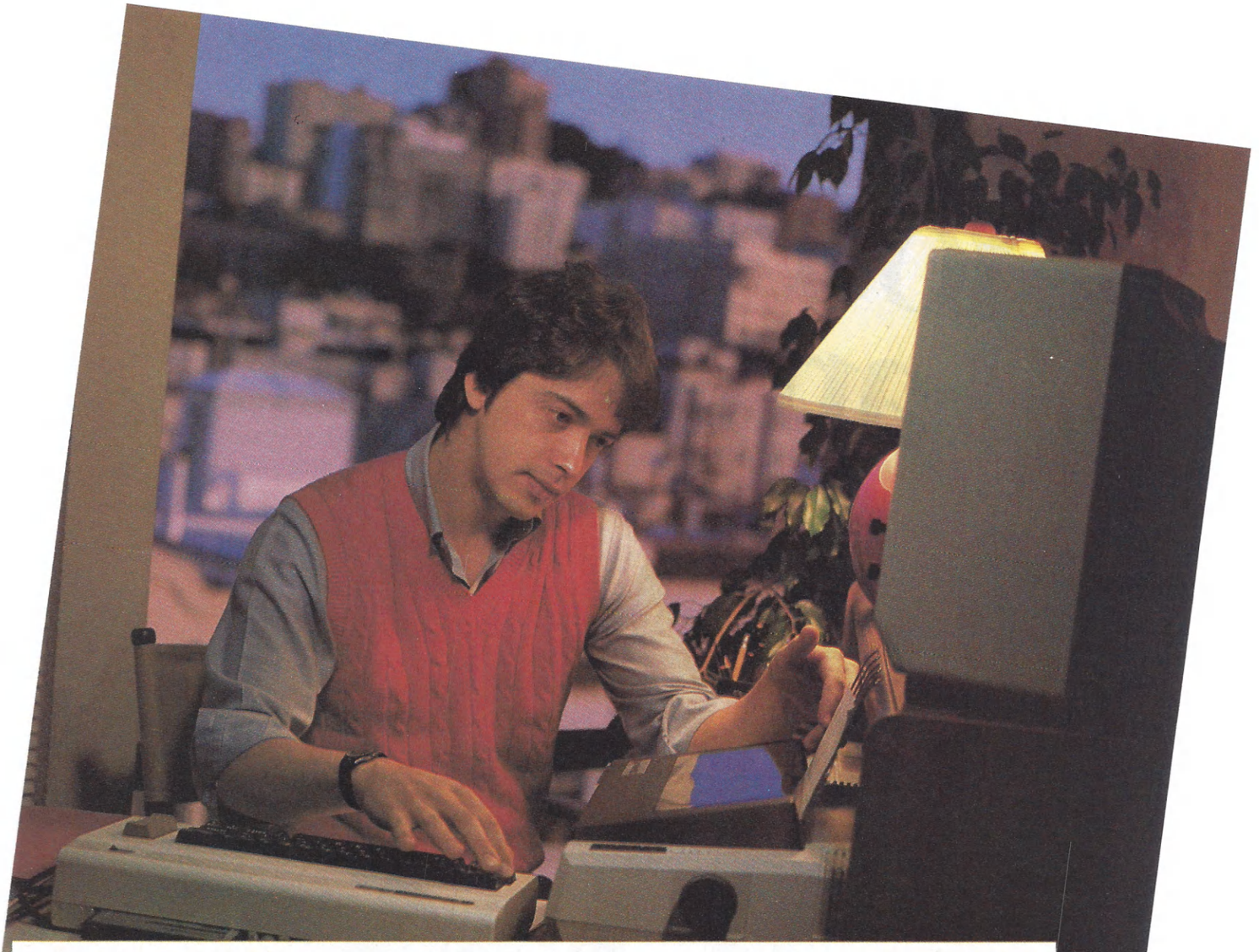
Where videotex has succeeded at all, as Sigel makes clear, is in specialized areas where potential users have a need to know specific information on a timely basis. For example, there are a few successful agricultural videotex services that farmers have come to rely on. In addition, Dow Jones, the parent company of *The Wall Street Journal*, has long offered a financially oriented News/Retrieval Service that boasts many business users. At the end of 1983, the News/Retrieval Service had 100,000 subscribers and it is currently growing at the rate of 5,000 per month, according to Sigel. A Lockheed subsidiary, Dialog Information Services, has become a major distributor of on-line data bases with several hundred thousand users, again, mostly in business. And there are other somewhat less commercially successful ventures of this type which include Delphi and BRS After Dark.

A major factor—perhaps the only one—in the rise of these information retrieval services has been the personal computer. The addition of a modem and communications software will turn a personal computer into an effective videotex terminal for receiving text and tabular information. Of course, this type of use does not permit the kind of fancy graphics that are possible with an advanced videotex terminal, but retrieval service users usually need specific data more than elaborate, four-color pictures.

For all this breast beating and hand wringing, Sigel's book makes for interesting reading. Long an expert observer of the videotex business, Sigel explains the technology of the subject, the nature of information services and the outlook for the future in a readable and succinct manner. Several of the chapters by Sigel and contributing experts are devoted to videotex in other countries, notably the United Kingdom, Canada and France, where the service has had more exposure, if not more success than in the United States.

The book is a mine of statistics about videotex, as might be expected from an experienced journalist and author. But Sigel tempers these statistics. He suggests, for example, that people should read *The New York Times* that is pitched into their driveways every day, rather than flip through the Dow Jones News/Retrieval Service as they crunch their morning cereal.

Sigel concludes his book on a slightly upbeat note by saying: ". . . given the nearly irresistible appeal of the technology, videotex is bound to come." I agree with Sigel's conclusion but not his rationale. A more apt conclusion might be: Given the need we will have for knowledge in the future, videotex is bound to come.
—*Jeffrey Bairstow*



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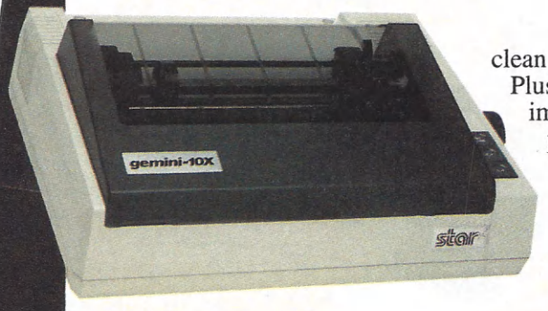

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CIRCLE 35

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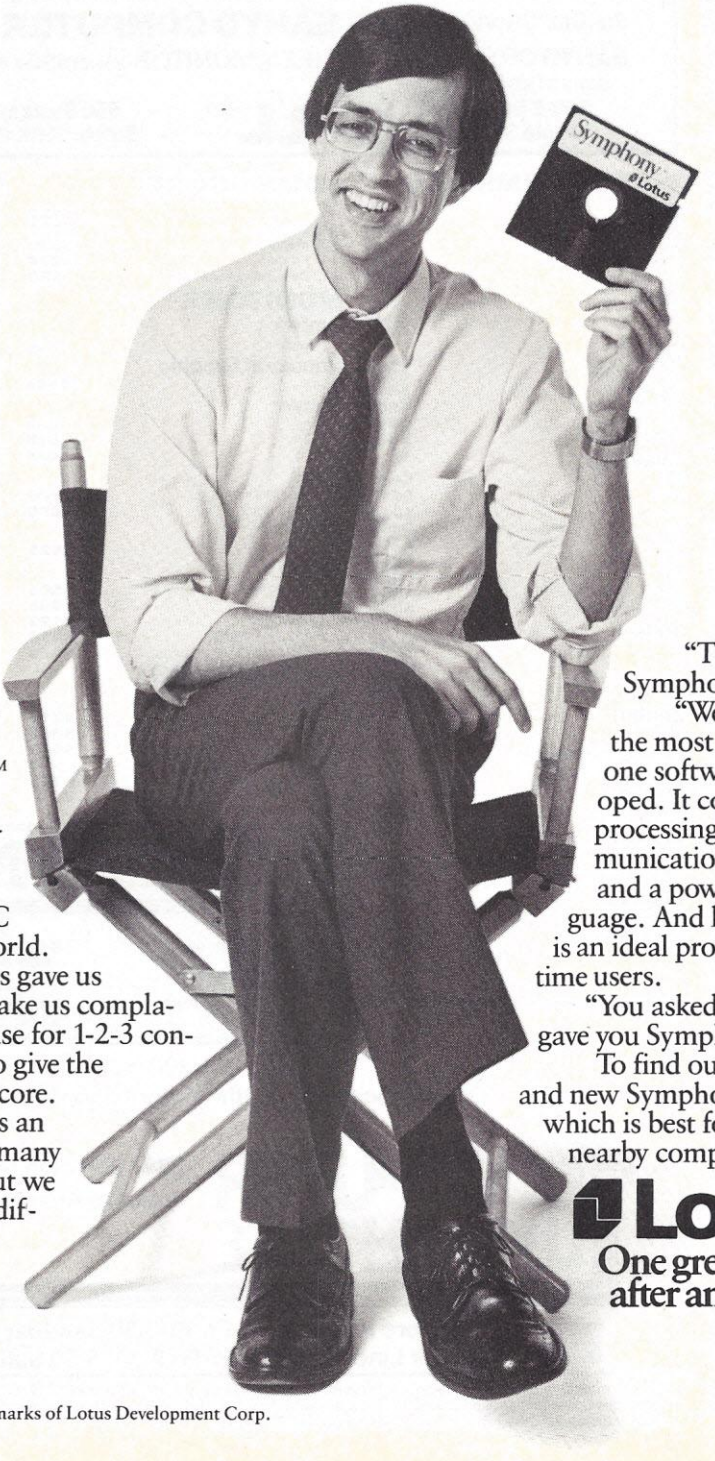

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SYSTEMS

KAYPRO 2X

Kaypro 2X, an upgraded version of Kaypro 2, offers all the same features as its predecessor, but is equipped with double-sided, double-density disk drives designed to give the computer twice the storage capacity. According to David Kay, vice-president of marketing for Kaypro, "We feel that most users will be anxious to pay only an additional $300 for a computer offering twice the capability."

The Kaypro 2X offers 64k of RAM, a built-in 9″ non-glare monitor, a detachable keyboard and portability in one package. The software supplied with each Kaypro 2X includes M-Basic, C-Basic, CP/M, WordStar, The Word Plus, CalcStar, InfoStar, DataStar and selected games.

Retail price is $1595.

FOR MORE INFORMATION: KAYPRO CORP., 533 Stevens Ave., Solana Beach, CA 92075; (619) 481-4300.

Alex 500A

Featuring a dual Z-80 and 6502 microprocessor with 64k of RAM, the Alex 500A portable runs Applesoft and CP/M software. Alex 500A has a detachable keyboard with a numeric keypad, four expansion slots, two disk drives, serial and parallel ports and a built-in 5″ monitor. The unit weighs 18 pounds and measures 15″ by 14″ by 5″.

$2495

Comp-U-Save
Turtle Creek
P.O. Box 1300
Skyland, NC 28776
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MPF-PC/XT

Featuring an integrated 10Mbyte hard disk drive, the MPF-PC/XT also provides 128k of RAM expandable to 256k, dual serial communication ports, one parallel port and five expansion slots. A monitor is included.

$3995

Multitech Industrial Corp.
315 Fu Hsing N. Rd.
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Taiwan, Republic of China
(02)713-4022
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QDP-500

The QDP personal computer system from QDP Computer Systems comes standard with 128k of RAM, a floppy disk drive, cache memory and a Z80A CPU. The QDP-500 can be expanded with an extra 256k or 512k of RAM and is available with a 10Mbyte Winchester hard disk.

$1995

QDP Computer Systems
10330 Brecksville Rd.
Cleveland, OH 44141
(216) 526-0838
retail

PERIPHERALS

HUSH 80 PRINTER

The Hush 80 portable thermal printer weighing only 28 ounces features 80-column bidirectional printing at 80 characters-per-second and graphics at 4800 dots-per-inch. Offered in three models, Hush 80 can be equipped with an optional built-in rechargeable battery pack.

The model Hush 80CD provides direct interfacing to Commodore personal computers. The Hush 80P is a Centronics-type parallel interface version, while the Hush 80S provides a serial RS-232 interface. All Hush 80 models include the interface, interface cable, 100-foot roll of thermal paper, and a 9-volt A/C wall tranformer.

According to Rhine Meyering, Ergo Systems vice-president of marketing and sales, the Hush 80 was designed to fit "edge-on into a conventional briefcase" and therefore has significant potential as a portable or lap-sized personal computer peripheral.

The Hush 80 printer measures 11.63″ by 5.5″ by 2.8″ and retails for $159.99.

FOR MORE INFORMATION: ERGO SYSTEMS, INC., 1360 Willow Rd., Menlo Park, CA 94025; (415) 322-ERGO.

The Axiom GP-550

Designed specifically for personal computers, the GP-550 offers both standard dot-matrix printing and near letter-quality printing in a single unit eliminating the need for two separate printers. The GP-550 has multiple copy capability and can print 140 different characters.

$299

Axiom Corp.
1014 Griswold Ave.
San Fernando, CA 91340
(818) 365-9521
retail or direct order

The Chipmunk

The Chipmunk from Orange Micro, Inc., is a parallel interface with a clock/calendar standard feature. The interface includes Chipdisk software.

$145

Orange Micro, Inc.
1400 N. Lakeview Ave.
Anaheim, CA 92807
(714) 779-2772
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Electronic Compact NP

The Electronic Compact NP, an entry-level dot-matrix printer, is equipped with a parallel Centronics compatible interface and an optional serial RS-232-C interface. In text mode, the Electronic Compact NP offers bidirectional logic printing. In bit-image mode, it is unidirectional. Its 9-pin print head is capable of printing a full 96-character ASCII set, with descenders and seven international character sets. The Electronic Compact NP also has a print buffer of 2000 characters.

$499

Olympia USA, Inc.
Box 22
Somerville, NJ 08876
(201) 722-7000
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Intec 300 Modem

The Intec 300 is an auto-dial/auto-answer modem which features software and essential phone-computer interface connections to function compatibly with several computers including the Kaypro II, 4, 10; TRS-80 Model III/4 ; IBM Personal Computer; and Apple II series.

$189

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P.O.Box 5164

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Tilt Screen	YES	NO	YES	NO
Quiet Operation	YES (NO FAN)	NO	YES	NO
Memory	128K	128K OPTION	256K	256K OPTION
Graphics Display (640 x 200 resolution)	YES	OPTIONAL	YES	OPTIONAL
Printer Port	YES	OPTIONAL	YES	OPTIONAL
Communications Port	YES	OPTIONAL	YES	YES
MS™-DOS/BASIC®	YES	OPTIONAL	YES	OPTIONAL
System Expansion Slot	YES	YES	YES	YES
RGB and Video Port	YES	OPTIONAL	YES	OPTIONAL

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For example, our tiny custom chips do the work of many of the larger, more expensive circuit boards in an IBM PC. So we can offer a computer system that comes in one attractive, integrated case, is ready to run and occupies less desk space. A computer that edges out IBM's added-cost component system for reliability, ease of service and purchase simplicity.

Fewer circuit boards to cool also allowed us to eliminate the noisy, irritating fan IBM and most other PCs force you to put up with. And TeleVideo compatibles accept any IBM hardware options without modification.

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Features	TPC II-S	IBM PC
High Capacity Storage	YES	YES
Quiet Operation	YES (NO FAN)	NO
Display	YELLOW	AMBER
Memory	256K	256K
Graphics	YES	YES
Communications Port	YES	OPTIONAL
Printer Port	YES	OPTIONAL
MS™-DOS 2.11	YES	OPTIONAL

THE BEST LINE.

But the Tele-PC is only one element of the TeleVideo IBM PC Compatible line.

The TeleVideo XT is the best hardware for users of popular IBM XT software who would appreciate an extra 10 megabytes of storage capacity along with the advantages listed on the chart at the left.

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Wang PC Color Monitor
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BITS & PIECES

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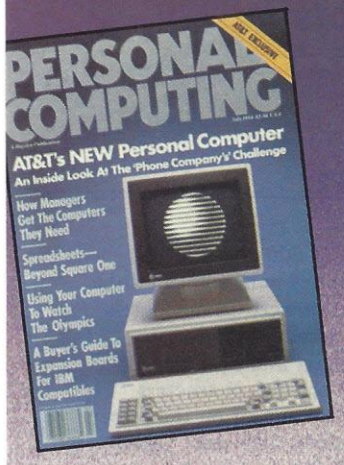
FOR MORE INFORMATION: ENGINEERED DATA PRODUCTS, INC., 470 E. 76th St., Denver, CO 80229; (303) 289-4676.

The C600 Smartline Cable
Computer Acessories Corp. now offers a "smart" cable that allows many popular printers to work with the Commodore 64 and VIC 20 computer



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PRODUCTS

systems. The C600 comes with software utilities built right into the cable. These convert Commodore's non-standard codes into a more standard format and as a result printers can produce characters exactly as they appear on the screen. The C600 works with most parallel printers including models from Anadex, Brother, C. Itoh, Epson, NEC, Okidata, Star Micronics and Transtar.

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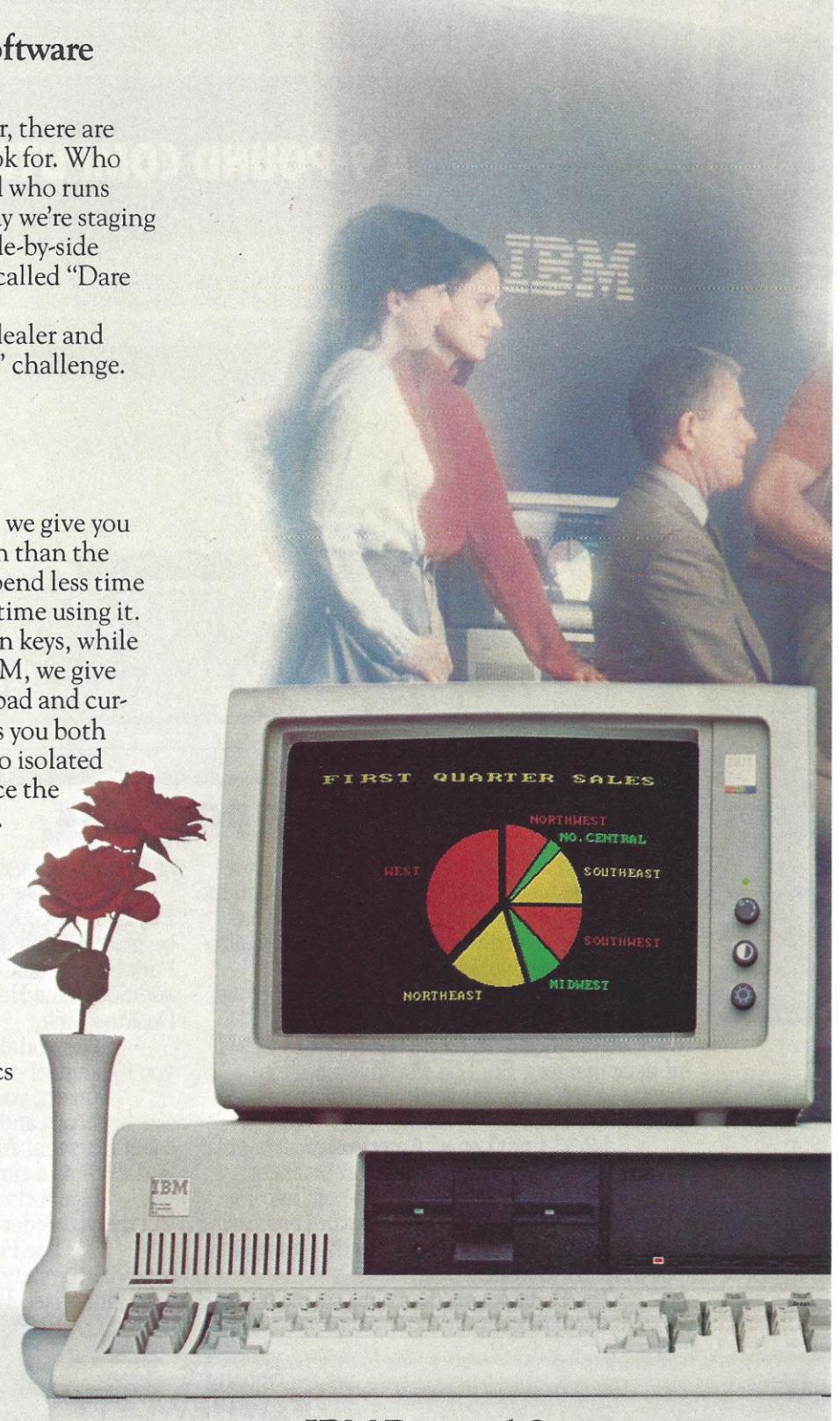

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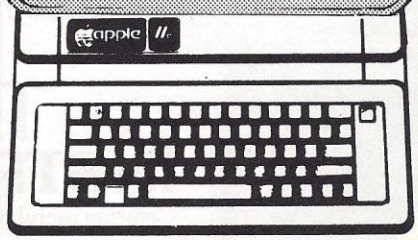

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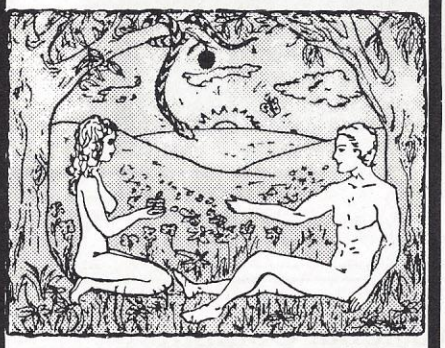

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BUSINESS

FLASHCALC

FlashCalc, the newest addition to VisiCorp's VisiSeries, is designed to be a high-performance, low-cost spreadsheet program for the Apple II series. The FlashCalc program features variable width columns, formatting features which automatically set special symbols, a complete set of financial functions, "pop-down" menus which add to the ease of learning, the ability to control and secure data, and a "/" command which allows the experienced user to bypasss menus.

"FlashCalc offers more functionality and faster execution for the Apple II family than any other spreadsheet package available today," says Dan Fylstra, chairman of VisiCorp. "FlashCalc has the power and capabilities needed in the office, yet offers the ease of use and reasonable price which makes it attractive for use at home as well."

FlashCalc will operate on a variety of machine levels from 64k to 512k of memory and offers hard disk support. Additionally the program can utilize data files created with Apple II VisiCalc, as well as DIF and template files.

A machine configuration utility

GEMS OF WISDOM

Extending The Life Of Your Ribbons

If you'd like to extend the life of your nylon printer ribbons and delay replacement costs, try this: Open your printer's ribbon cartridge and spray the ribbon with WD-40. Leave the cartridge open overnight. If you over-spray the ribbon, however, you may have to let it air out for a few days so it's not gummy, so spray lightly and repeat the process if the first application doesn't do the job.

I've used WD-40 on a ribbon as many as five times, with no ill effects. In addition, the spray is just the thing for keeping the print head on a dot-matrix printer lubricated. This process will also work with spool ribbons, but it's harder to spray them evenly without soaking them.

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allows program adaptation to a wide variety of peripherals and add-ons. FlashCalc supports an extensive list of peripheral equipment, including eight different RAM cards, three 80-column cards and two disk emulators. It also supports the Profile hard disk drive.

FlashCalc retails for $99 at dealers nationwide.

FOR MORE INFORMATION: VISICORP, 2895 Zanker Rd., San Jose, CA 95134; (408) 946-9000.

ATI Software Sampler

The first two packages in this product line, the ATI Spreadsheet Sampler and the ATI Word Processing Sampler, are interactive disks that give the user about 10 minutes of hands-on review of popular spreadsheet, financial planning and word processing packages. These programs will allow personal computer users to sample a variety of software packages before deciding which ones to buy.

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The Electric Desk

Aimed primarily at the PCjr user, The Electric Desk combines word processing, spreadsheet analysis, data base management and communications into a single integrated program. It features advanced functions such as windowing, a macro programming language and context-sensitive help.
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File Search 3

File Search 3 is an information management system providing quick indexing and retrieval of filed information. The program has "fuzzy search" capabilities using partial criteria such as a date or key word and uses a fill-in-the-blank screen form and menus for easier operation.
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EDUCATION

PEANUTS PROGRAMS

Random House's new line of programs for the Apple II family features Charles Schulz' famous Peanuts cartoon characters. The six new Peanuts programs, designed for children preschool age to 12 years old include: Charlie Brown's ABC's, Peanuts Maze Marathon, Peanuts Picture Puzzlers, Snoopy's Skywriter Scrambler, Snoopy to the Rescue and Snoopy's Reading Machine.

Charlie Brown's ABC's is designed to teach children the alphabet using the Peanuts characters. Individual letters appear on the screen in both upper- and lowercase letters. If the child chooses the correct corresponding letter on the keyboard, the Peanuts character presents an animated cartoon vignette based on a word beginning with the letter.

Designed to help young children with motor and coordination skills, Peanuts Maze Marathon features an infinite number of randomly drawn mazes with animated graphics. Peanuts Picture Puzzlers is an animated puzzle program with hundreds of combinations created by the computer or the child himself.

Snoopy's Skywriter Scrambler, a

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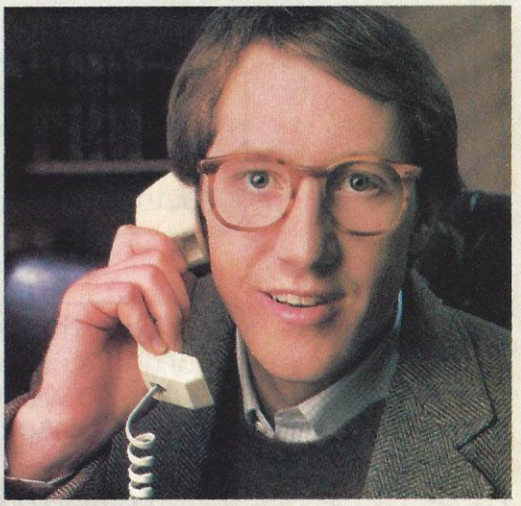

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PRODUCTS

word recognition program, challenges the child to make as many words as he can from the letters in a given word. The arcade-style program, Snoopy to the Rescue, challenges the child to help Snoopy climb Castle Danger. The castle is booby-trapped with math problems, which makes Snoopy's and Woodstock's escape even tougher. Finally, Snoopy's Reading Machine introduces children to word families by changing the initial letter of words to build different, but similar sounding, words.

Each of the new programs contains graphics accompanied by music designed to captivate, motivate and reinforce. All six Peanuts programs retail for $39.95.

FOR MORE INFORMATION: RANDOM HOUSE, 201 E. 50th St., New York, NY 10022; (212) 355-5049.

Challenge Math

Alien Intruder, Digitosaurus and Math Mansion are included in this package which lets children ages 6 to 11 practice basic math, estimation and problem-solving skills.

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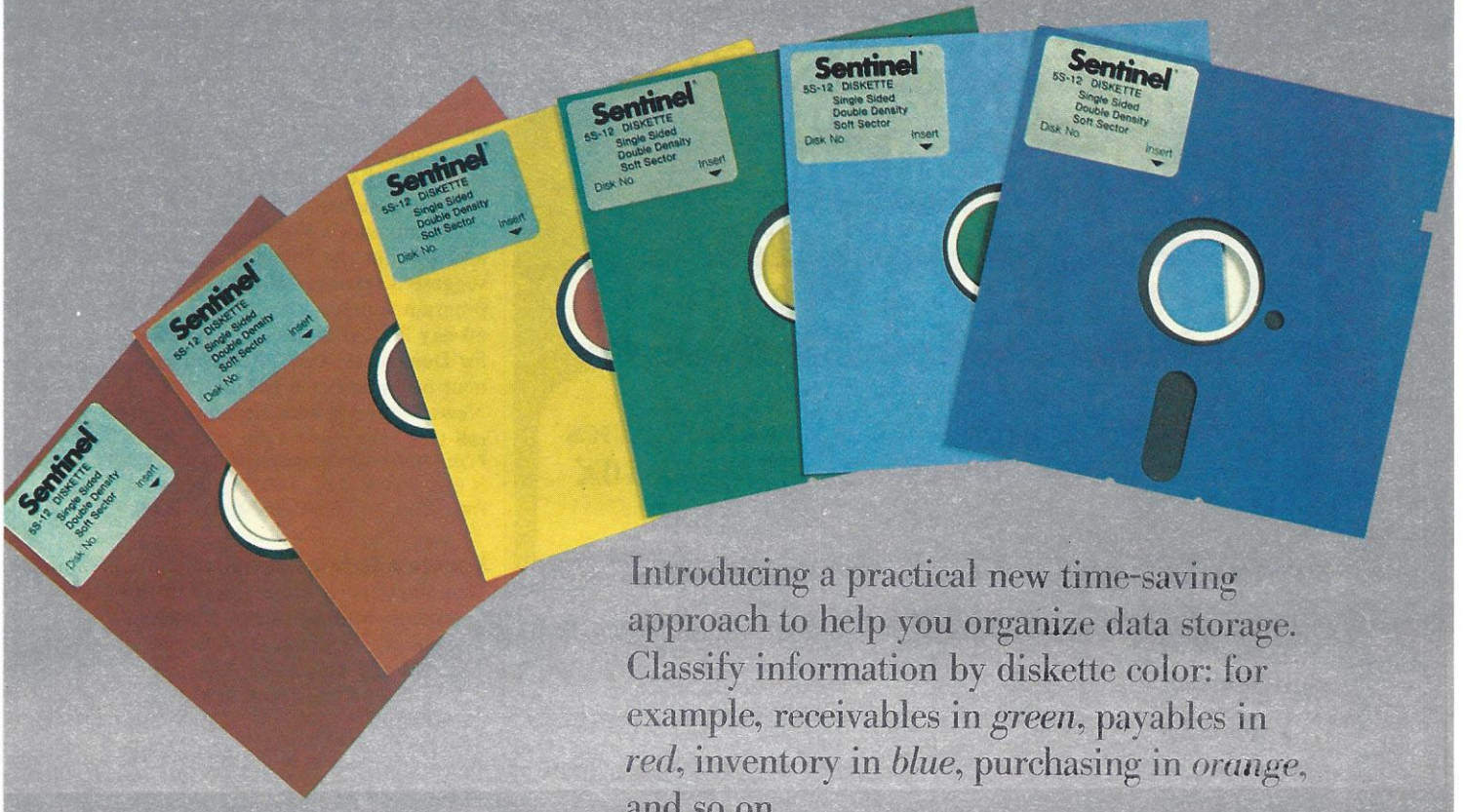

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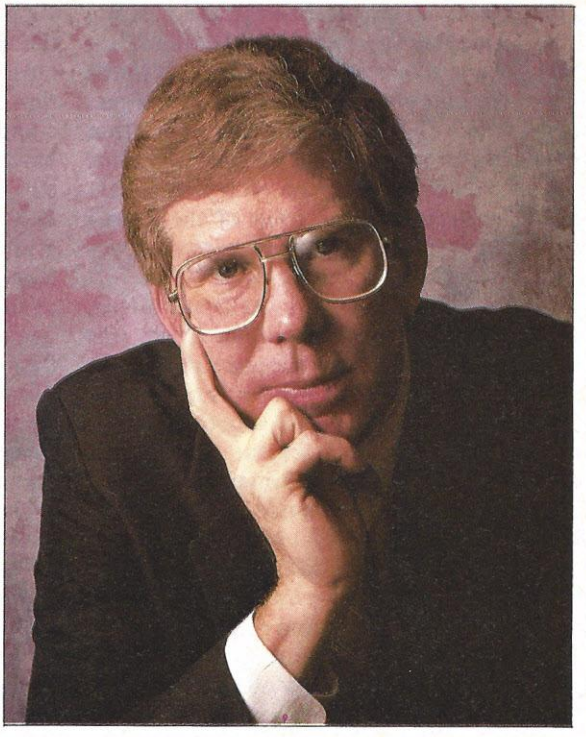
IBM's Don Estridge: Big Blue's Total Strategy



Photograph by William Coupon

Philip D. Estridge, called "Don" by preference, is the only boss IBM's Entry Systems Division (responsible for the company's personal computer product line) has ever had. IBM, on the other hand, is the only boss Don Estridge has ever had. "Big Blue" hired the University of Florida graduate electrical engineer in 1959, and took him north from his home state to the wilds of Kingston, N.Y., where he saw his first snowfall.

After a number of other stints which included design and project development, Estridge went back to Florida —to IBM's developmental project facility in Boca Raton —in 1969. In August, 1980, he was made an IBM vice-president and president of Entry Systems. Starting with some 12 initial employees, the Division has expanded to 10,000. IBM Personal Computers can come off of its Boca Raton production line as fast as one per minute. Its machines and operating system have set a virtual industry standard. All in four years.

Yet at the point recently when Estridge sat down with Personal Computing's *editor, Charles Martin, and executive editor, Robin Nelson, Entry Systems was not basking in its glories. A sales slowdown, while relative to a meteoric rise, was a fact. And among the basic, what-do-we-do-for-an-encore problems crossing Don Estridge's electronic desktop (he's one of the few top managers who actually uses a personal computer) were the following:*

- *It was looking more and more as if IBM's Personal Computer 1984 sales year would finish as many as a million units short of the two to three million some analysts had predicted (most of them after widely underestimating its 1982/83 sales performance). The company's unwavering "stonewall" policy precluded Estridge's directly addressing this situation— even after his division's wide ranging price cuts in the first week of June would confirm, for even the most casual of observers, the softening of demand.*
- *IBM's chairman, John Opel, had been induced to say publicly that the PCjr, Entry Systems' expensively advertised, roundly criticized try at a supposed home user market, had fallen short of his own expectations. This uncharacteristic break in stonewalling at the top put even more pressure on Estridge and his associates who were obliged to remain totally vague for several months, until their package of PCjr "fixes" (including the June price cut) was announced.*
- *Boca Raton was becoming a fishbowl. Although it accounts for no more than a tenth of IBM's total revenues, the personal computing end of its business is a glamour subject for financial page reporters who would*

otherwise have to file stories about mainframes and microchips. Wall Street, as a result, loads a disproportionate amount of bellwether status onto the volatile industry. When IBM's stock fell through its "support price" level following Entry Systems' June price cuts (to rebound strongly on rumors of a stock buyback plan which the company immediately denied), some analysts said IBM was capable of dragging down the entire stock market. In recent weeks, extensive stories on alleged IBM shortcomings—all based primarily on information from outside analysts or former IBM employees—have covered mistakes in planning the PCjr (BusinessWeek), *lackluster sales of the PC Portable* (The New York Times) *and retailing gaffes in its own product centers* (Fortune).

- *AT&T became a player. Although the "phone company's" initial, Olivetti-built personal computer raised few eyebrows, it fit the prophecies of an Armageddon-like struggle to come between the two giants, in which each will have to dedicate additional resources to react to the other in many product areas.*

In this atmosphere, Don Estridge agreed to talk to Personal Computing *about his personal and corporate goals.*

Why was all this put here in Boca Raton?

Estridge: I grew up in Florida [laughs], but it's not quite that simple. The original team that put together the [PC] proposal was already here. The mission of this facility for IBM has been to look for ways to introduce computers at lower and lower prices to the consumer. So that is where people in IBM tend to gravitate when they want to work on projects at the small end of the scale. So we had the assignment to look for that. When the assignment was accepted, we had to staff it with people and there wasn't anyplace else we could think of that offered the skill base and facilities and opportunity that was a better alternative. We did look at about three other places before deciding.

How has it been different down here from what is considered the traditional idea of IBM?

Estridge: Well, it's hard for me to say because I don't see IBM from the outside. To me it has always been a very dynamic company. I have never not been busy. And I have never not been pressed and I have never not worked overtime. I have never not traveled. If I compare my situation with people outside of IBM who are trying to do similar things, I find that they're the same: They have to travel, they're pressed for time and have many more things going on than you can possibly imagine anyone being able to do. They have a good sense of balance, in terms of a family life and business life. I just don't find what we're doing here that different—there's no inside versus outside if a person is trying to get something done. Most of the folks I know are busy, active, interested, energetic, competitive.

Especially when we first started. For whatever reason, our group was described as entrepreneurial. And in one sense of the word it is true—in a small group working together we discovered and created our own destiny, and we were encouraged to do that. But on the other hand there were some underpinnings that were sort of given. Most of the people who were in the group then and now were long-term IBM employees and after that period of time you pick up a certain set of beliefs. You wouldn't be able to throw those out even if you consciously tried. After that many years devoted to a company, you believe in what the company believes or else you leave and so all of the things that you would associate with IBM were in the project.

We worked much closer to the end user than in a normal development project where it takes many years . . . I mean, we couldn't do every project the same way. There's a temptation to think, well, now that we've done an entrepreneurial thing why don't we take that model and just plug it in anywhere. But we are talking about a business where we are trying to create technology and performance that is ten, twenty or a hundred times where it is today. It will take years to be that creative. That is not an entrepreneurial activity. That is a different activity.

What is the essential IBM approach today?

Estridge: You can't assume there is any one way to do anything. So we try to keep our projects small, and we try to keep a lot of them going at one time. There is what seems like an endless supply of competitors in this part of the group and our view is that we always want to beat the best combination of the competitors—not just one competitor. And that makes it very hard. We try to match this feature of our machine with that competitor's best, and this characteristic of a program with what's best. And so you put together an imaginary system made up of the best of everything. And then you tell yourself you want to be better than that.

How closely do you watch what everyone else is doing?

Estridge: I don't know if you can talk about it in terms of how closely, but you are crazy if you think we don't know who our competitors are. We have to know the business here. And part of knowing the business is not just knowing what the customer needs, but knowing how possible it is for those needs to be satisfied by competitors. And surprisingly enough, at least in the personal computer part of the business, the competitor is not necessarily another personal computer. We are talking about the discretionary spending—the person may buy something else that is not a computer. It may be a high-tech item such as a smart TV set, a VCR, or even just going on a vacation. We are talking about a dollar level where there are lots of other very good alternatives, besides buying a personal computer.

Let's talk about the American business office: Where do you see the computer on the person's desk going?

Estridge: I definitely think more computer power can be applied to some tasks in the office, but I don't think you're going to walk in one day soon, open the door and find it's all electrified—able to talk to you and read your mail. I think it will happen more gradually. For instance, we've talked about the handling of electronic distribution of documents becoming technically and economically feasible, but we haven't been able to do it because of the cost of technology. But it is starting to happen. I think the trend will continue, and as the economics continue to get better you will see them integrated, not only on the desktop but in the wires, in the switching systems, and on and on.

I don't think there is any magic in it, but right now in our office we have had the machines arranged so that all of the desktops and all the machines are hooked up over telephone lines to directories and things like that.

Is that the kind of office environment you see for the future? The question, really, is whether the essential computer will be totally individual versus sharing data with the traditional mainframe?

Estridge: I think it will be all these things. We are on a discovery mission; we're experimenting, our competitors are experimenting. And if you go to any one location and ask 'What are you doing?' you'll find they're trying to solve a particular problem they have at the moment—not trying to create a world-class office system. And so they are making priority assignments based on which functions are most urgent for them.

In our office here, the most urgent are calendar and telephone management. We find that computational-oriented activity is not something that needs to be shared. We all do computations with Multiplan and Lotus and a couple of experimental programs we're working on. And I need those, but I use them as an individual; the fact that the machine is connected to somebody else's is an accident at that time. But inter-connection is critical to managing; the calendar is always changing and we get an enormous amount of mail and an enormous amount of telephone traffic. Managing that business is what our system lets us do.

> *"I don't know any top managers in IBM or any other business who are averse to having tools that help them."*

How do you see that evolving?

Estridge: Well, I think the next step is this: The fellow I work for in New York, he has the same problems in his office as I do and now we need to talk to each other. We're going to end up talking directly or through the mainframe. We can do it either way. Which way we do it depends on some other things going on—not in terms of new products but in terms of how we want to do it. Do we want to do it this way for a short period of time, and that way later? Or do we want to start with it later and just continue to do that?

Is it a concern to you that you're the exception—that few other top managers are this involved? That many of them see what you are talking about strictly as a middle management system?

Estridge: I am just trying to stay on top of what I am doing, whether it is an exception or not. I cannot manage my office on an envelope anymore. And neither can my secretary. We have three secretaries here who handle my office and the office of one of my staff members, and having three separate books on the desk to write assignments in doesn't work. They have to have one book and the only way to have it is electronics. To me, if there is somebody else who has an office that has a problem I have, and they are not doing what I am doing, then they are not as well off as I am. Not that I am trying to be a unique individual.

But what about the top management bias against using personal computers that obviously exists?

Estridge: I don't think that the bias is there. I think the reason why top managers may not choose to have a machine today is because it doesn't solve their problem and when it does solve the problem they will have one. I don't know any top managers in IBM or any other business who are averse to having tools that help them. And the fact that they don't use them today means that we haven't yet figured out how to solve their problem.

It doesn't do any good to put a machine on your desk that does letters that doesn't also do the calendar and the mail. I mean, that is the job of the manager—calendar and mail. It is not calculating spreadsheets; he has a staff for that. Until you do solve that problem, you haven't got any applications. And complaining to a top manager that he is not living in modern times is like trying to push water uphill.

You think there will be one thing that really hits home for the executive?

Estridge: Yeah, it is a combination of the calendar, the telephone messages and electronic mail. When you can do all three of those with a homogeneous, electric solution you're letting the executive do business exactly the way it is supposed to be done.

Is that the IBM strategy?

Estridge: Sure.

Does your division fit in all of those roles?

Estridge: Yes, that is why we announced that we were putting in the Displaywriter function on the PC. That is why we announced PC Clusters. All of our focus is on how to solve

that application problem. If you could ever get to the point where that is solved, all of the other things people do on the PC—like spreadsheets, letters, data bases—come along for the ride. They just fit.

What do you see as the role of the telephone in all of this—or the telephone wire?

Estridge: For a while we're going to see the phones fundamentally in a period of transition, both in terms of system design and the economics of wiring it. We're going to see multiple wires and they'll have different value characteristics. Some will be there because the distance you have to cover can only be covered by using communications networks—since you can't stretch a local area network that far. So I think we are in a time of transition and, in addition, when we get out of it we may not to want any single magnificent solutions because there may be more than one problem to solve.

For instance, we announced a LAN [local area network] for the factory environment that was different from our LAN that we are working on for the office. You say, 'why in the world would you do that?' The answer is that the problems in a factory are different from the problems in the office. There is noise, there is exposure to a hostile environment—temperature extremes, things like that—and so certain kinds of wiring properties are required and some are not required. You can't make the factory work the way the office does. It is a fundamental problem you can't solve. On the other hand, you may not want to take the stuff from the factory and put it in the office because the characteristics are different; cost factors, and so on. So, I think those kinds of tradeoffs are going to cause us to want to allow multiple solutions for a while for the industry as a whole—to mull these things over and think about them.

Do you view a personal computer as more than an intelligent workstation?

Estridge: The term 'intelligent workstation' is very hard to understand. It means so much to many people. For me, the personal computer just lets me do some things that I want to do—that I didn't know I wanted to do. But when I am using the personal computer and when I am not using the spreadsheet, for instance, the machine may not be a personal computer—in terms of the relationship. I have a machine at home and when it is being used it's not a personal computer—it's no different from a yellow pad, a television set or a telephone. It's simply a means to get information.

Where do you see the computer in the home going?

Estridge: I think there are going to be two trends for a while—again, because we're in a state of flux. One of the trends is that there will be more and more people who use the machine to process their own personal information, but using the same applications as businesses use today to process work. The easiest two examples are the spreadsheet and the word processor. And using those tools in the home for your own personal information will become more and more popular as more and more people become uninhibited about doing that.

When you say doing work in the home, people sometimes think taking work home is what you mean. That is not what we mean at all. It means using the application tools to apply them to the information at home. And the people I know who are doing that are getting leverage on their situations. They are either more careful with their money or getting more out of their money. And things that were put off because of—'Oh, I have to get out the typewriter,' or 'I have to think up a letter'—are not put off. There is no cataclysmic event, but it just sort of gets easier. I think that is the fastest moving trend we're on today.

The other trend is that there's this tremendous number of data bases and information. You can *not* deal with the information that's available anymore. I can't imagine how any more information can be delivered to people. So the focus has to become making sense of it and getting access to it. I think using personal computing in the home will be a means of collecting and analyzing [the output of] data base services and information delivery services.

Where do you see IBM in that (home) arena versus—in addition to—to the office arena? Are those going in parallel or complementary directions?

Estridge: We think of them as different things. The Merrill Lynch and videotex arrangements we have, the work we're doing with personal computers in communications . . . we're coming at slight variations of the situation. But the underlying technology doesn't recognize where computers are; the end of the wire doesn't care if it's in the home or the office. You can't avoid the recognition that, to the degree that you can solve the system problem by moving data and processing it, then it will be as easy to do that in the home as it is from an office.

I think you will see those combinations start to occur as technology makes it possible, whether it's possible in the home or the office. We use videotex inside IBM right now to transmit mail and messages, look up information and go out to the airline guides. If you are at home and dial into [that kind of] system, which you can do, is it a home system or an office system? The lines start to blur.

Then does your computer at home become just a smart telephone?

Estridge: I don't know if the computer will ever be thought of as a telephone. The processing power is so enormous. I mean, we're talking today about having a machine in the home that would have occupied the floor of a building 10 years ago. The compaction is tremendous. And then using it just to do telephone functions is really overkill and misusing the technology.

We meant that it is just the end of the machine, it gets information or data that's sorted outside and is brought

into your television set.

Estridge: I don't know if the telephone delivery system is the only way you could get data. You could get it from your network system. There is nothing apparent from computer or communications technology that says the telephone wire is the only way to do it. There are people exploring all those techniques and I just don't know how all of that stuff will come out.

Who do you see as the big players in the personal computer market?

Estridge: I haven't the foggiest notion. In 1980, less than five years ago, IBM wasn't one of them. I wouldn't presume to know. . . .

What about today?

Estridge: I get bombarded by 150 big players every day in the newspapers and magazines. Have you looked at television? You cannot see a personal computer ad on television that doesn't compare whatever it is advertising to the IBM. I think they are all big players.

But who do you, as IBM, view as the players . . . or do you do that?

Estridge: We don't. That is what I am trying to tell you. We look at everybody who has a product to offer the customer, and we try to ask ourselves, 'How do we stack up?'

Now that AT&T is in the market, where do you see them going?

Estridge: There are many interesting companies in our industry, but I wouldn't want to single any out or rank them.

Then you are not really reacting?

Estridge: I have a strategy that I am trying to make successful with the business I am responsible for. And I measure my success not only on how I am doing in terms of making business goals that are set for me, but if I am accomplishing the right things successfully—are the customers who buy my products being helped? Then I ask myself the question, what other alternatives does the customer have? What alternatives in terms of competitors or alternative products?

You cut prices across a wide range of products early in June; comment on this in terms of on industry slowdown..

Estridge: We at IBM haven't seen a slowdown. Demand is still strong for the IBM PC, PC XT and the PC Portable. A lot of people looked at our June 7th announcement as a price reduction, but the real significance was our announcement of the 256k version of the IBM PC and XT at a price that is very attractive for the performance they offer. These new 256k versions are designed to satisfy growing customer demand for increased functions and ease of use in their personal computers. We see this reflected in the popularity of today's new, easy to use and more powerful applications programs that require larger amounts of memory for features such as windowing.

> *"We look at everybody who has a product to offer the customer, and ask ourselves, 'How do we stack up?'"*

The second part of our announcement was the price reductions, which simply reflect on our part another increase in value for IBM PC customers. You may recall that we also reduced prices in March 1983, when we introduced the XT and the 64k version of the PC.

Speaking of windowing, are you going to offer it in a non-mainframe-connected environment?

Estridge: I really can't discuss specific products beyond saying that we are alway looking for ways to offer better performance, utility and value. I wouldn't rule anything out for the future—we have seen a growing trend toward the easier to use, integrated programs, including windowing.

Where is personal computer technology going?

Estridge: I think that the machines will become richer functionally, and the value relationship to the customer will become greater. I just think those trends will continue in a normal progression.

Since your division has grown in less then four years to be as big as Hewlett-Packard, or something like that, are you satisfied with your ability to respond to changes in technological parameters, that is, overall fast-changing situations?

Estridge: We are never satisfied—satisfaction is not what you are trying to accomplish. What you are trying to accomplish is to offer the best value possible for customers to choose. And to do things which are valuable and important—useful things. I think that's why people look on us as some kind of, oh, a little stodgy—because we're looking for the useful things, not the dazzling. We set our bar really high. We set our bar higher than we have any idea we can make it—it just takes your breath away. Because, when we miss we come down to a very high level. But then . . . if we're competitive enough [laughs], we're not going to miss.

Any personal thoughts?

Estridge: To me, the personal computer has done something only a few other products in American life have ever done because it has allowed people who are not technology-oriented to be creative. We have the 1983 Pulitzer Prize for drama going to a person who wrote a Broadway play on a personal computer. That surprised me. You find somebody like [jazz pianist] Oscar Peterson not having to go to a recording studio anymore because he can record as many tracks as they can play on a diskette and send it to the studio for mastering . . . you have Arthur Clarke writing his novel in Sri Lanka on a diskette and sending it by mail . . . to me, that's special. And that's what we're trying to do.

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